`A FINAL REPORT ON ENVIRONMENTAL MONITORING IN THE VICINITY OF VonRoll WTI Incinerator Facility, East Liverpool, Ohio

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Executive Summary

On October 20, 2000, the National Ombudsman released a preliminary report regarding the operations of the Von Roll Waste Technologies Industries (WTI) East Liverpool, OH hazardous waste incinerator. He questioned the results of the original trial burn and ambient air monitoring conducted in the East Liverpool, OH / Chester, WV area. He recommended that the facility halt the feeding of waste to the incinerator for a period of no less than six months, and make preparations for a retest of the trial burn, or a new trial burn in 2001, as a necessary step in the consideration by the Ohio Environmental Protection Agency (Ohio EPA) of the RCRA permit renewal for the facility. He also recommended that a new Addendum to the risk assessment for the WTI facility be prepared using the data from the new trial burn.

Subsequently, the United States Environmental Protection Agency (US EPA) conducted five rounds of ambient air sampling starting October 25, 2000. The sampling included four sites in the vicinity of WTI during the annual performance test, which took place November 13-17, 2000. The air sampling was conducted for metals, PAHs, Dioxins, VOCs and particulate matter as well as collecting appropriate meteorological data from three sites

Analytical results of the first round of ambient air samples, performed on October 25 - 27, indicate that most metals of concern were within typical urban ambient air quality levels, but that two metals, chromium and manganese had relatively higher concentrations. A second round of ambient air sampling was conducted on November 1 and 2. Results from this round indicated that while almost all compounds and metals were within typical urban ambient air quality levels, manganese concentrations were elevated. Chromium was not detected during the second round of sampling.

A third round of sampling was performed on November 6 - 8, 10, and 11. A fourth round of sampling was performed on November 13 - 17, and the fifth round was performed between December 4 - 10. Results of these sampling rounds indicated that all metals and compounds were within typical urban ambient air quality levels, except somewhat elevated manganese concentrations were detected during the last round of sampling at several locations. Total chromium was also detected at a few sampling locations.

Soil sampling was performed on October 26 in front of East Elementary School and on the school playground, and on November 15 in front of the elementary school and on Walter Street. The results of analysis for dioxins indicated presence of low levels of dioxins similar to the background levels detected in urbanized areas around the United States. The results for metals detected, when compared with the background levels observed in the Eastern United States, indicate slightly elevated levels of arsenic and zinc around the school and chromium and zinc at the Walter Street sampling location. Although other metals were also, they generally consisted of expected levels of metals such as, calcium and sodium.

The analytical results were provided to the Agency for Toxic Substances and Disease Registry (ATSDR) for their conclusions/recommendations on public health implications of this data and their findings are attached in Appendix A.

Introduction

In June 1983, the United States Environmental Protection Agency (U.S. EPA) Region 5 completed its review of an application for a permit to build and operate a hazardous waste incinerator in East Liverpool, Ohio. Region 5 issued a permit under the Resource Conservation and Recovery Act (RCRA) for the facility, referred to as Waste Technologies Industries (WTI). Because of several petitions for review of that permit, it did not become effective until January 1985. The facility began construction in 1990 and first became operational in late 1992. To verify the protectiveness of the applicable regulations for this specific facility in this specific location, a preliminary risk assessment was completed in 1992, a trial burn and numerous performance tests were conducted in 1993 through 1994, and a detailed risk assessment was begun. The detailed risk assessment underwent two independent peer reviews and was completed in May 1997.

Ambient air monitoring was performed at 11 locations in the general East Liverpool, Ohio and nearby West Virginia (WV) area during the construction and startup phase of the WTI incinerator (Figure 1).

For almost 20 years, this facility has been the focus of intense opposition by local and national environmental groups because of its location near an elementary school and a residential area. A recent concern was raised in a Preliminary Report issued in October 2000 by the EPA National Ombudsman. The Ombudsman's Preliminary Report suggested that erroneous or misleading stack test data or ambient air monitoring data might have been submitted shortly after the plant first began operation, and recommended that the plant be shut down for at least six months and be totally re-evaluated. Although the U.S. EPA believes that the Ombudsman's recommendations were based on factual errors in his Preliminary Report, it did take the concern seriously and responded by initiating an ambient air monitoring program around the WTI facility, and called for annual performance stack testing at the plant.

The U.S. EPA Environmental Response Team Center (ERTC) and the Office of Air Quality Planning and Standards (OAQPS) initiated environmental sampling and analysis in the East Liverpool area on October 25, 2000. The purpose of this report is to present the findings of the environmental sampling and analysis.

Five rounds of sampling were completed by December 10, 2000. All air sampling locations are shown in Figure 2. On October 25, 2000, ERTC mobilized its Response Engineering and Analytical Contract (REAC) contractor, and arrived on site for the first of the five sampling rounds. Initial air sampling was performed on October 25-27, 2000 (Sampling Round #1). Based upon the rapid-turn-around analytical results obtained from the first round of sampling, ERTC and OAQPS returned to the East Liverpool area on October 31, 2000, and performed ambient air sampling on November 1 and 2, 2000 (Sampling Round #2).

Analytical results from the second round enabled ERTC and REAC staff to return to the East Liverpool area on November 5, 2000, and perform additional ambient air sampling on November

6 - 8, 10, and 11, 2000 (Sampling Round #3). Based on site visits and the results of Sampling Rounds #1 and #2, OAQPS and ERTC designed a more comprehensive ambient sampling program to complement the emission testing scheduled for November 13-17, 2000. On November 10, 2000, additional REAC staff members were mobilized to the East Liverpool area to perform ambient air sampling on November 13-17, 2000 (Sampling Round #4), during emission testing of the WTI incinerator. OAQPS staff arrived on November 12 to coordinate ambient sampling efforts during the emission-testing period.

Air sampling was performed for volatile organic compounds (VOCs) (Sampling Rounds #1, #2, #4, and #5), metals (all five sampling rounds), polynuclear aromatic hydrocarbons (PAHs) (Sampling Round #4), dioxins/furans (Sampling Round #4), and inorganic acids (Sampling Rounds #1 and #2). Additionally, grab air samples for VOC analysis were collected at six air sampling locations and another two locations along the road adjacent to the WTI facility with Summa® canisters during Sampling Round #1, on October 26, 2000.

Soil samples were collected during Sampling Rounds #1 and #4 and analyzed for metals and dioxins/furans. Soil samples were collected from 10 sampling locations during Sampling Round #1 and from five sampling locations selected by the East Liverpool citizens group representative during Sampling Round #4. All soil sampling locations are shown in Figure 3.

Results from the first four rounds of air and soil sampling in the East Liverpool area revealed the presence of manganese and total chromium in some air samples**.** Consequently the US EPA/ERTC returned to the site and performed additional air sampling for metals and VOCs. On December 4, 2000, ERTC and REAC were mobilized for another round of air sampling (Sampling Round #5). Air sampling was performed for metals at 12 sampling locations and for VOCs at four sampling locations.

Air Sampling and Analysis Methods

Air sampling plans were developed in consultation with the Agency for Toxic Substances and Disease Registry (ATSDR), US EPA Region 5, OAQPS, and the Ohio EPA.

The majority of air and soil sampling throughout all the rounds were performed by ERTC and REAC staff. OAQPS staff performed particulate matter sampling (PM_{10} and $PM_{2.5}$) during Rounds 1 and 4 using Federal Reference Method (FRM) procedures. These methods also provided the ability to perform subsequent metals analyses, thereby providing a complementary sampling and analysis approach to the ERTC /REAC metals sampling, which utilized an open-face inlet for unlimited particle size collection.

The separate collection of PM_{10} and $PM_{2.5}$ size fractions allowed for identification of the dominant particle size fraction associated with high metals concentrations. The particle sizing provided a basis for inferring the type of sources that may be contributing to observed metals concentrations. OAQPS with support from its contractor, Research Triangle Institute, performed chemical speciation characterization (metals, ions and carbon fractions) of $PM_{2.5}$ aerosols during

the emission testing period. OAQPS staff also performed sampling for hexavalent chromium during the emission testing period.

Ambient air sampling and analysis for VOCs were conducted according to a modified US EPA Toxic Organic Compendium Method TO-14: *Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis*. Six-liter Summa canisters were utilized to collect time integrated and grab samples. Twenty-four-hour-time integrated samples were collected using Entech CS1200 flow controllers. Each controller was calibrated to collect 3.4 cubic centimeters (cc) of air per minute to yield an approximate volume of 4.9 liters over the sampling period. Grab samples were obtained by using a pre-cleaned, pre-evacuated canister, opening the valve and collecting the sample.

Ambient air sampling and analysis for PAHs were conducted following modified (GC/MS-Selective Ion Monitoring) National Institute for Occupational Safety and Health (NIOSH) Method 5515, *Polynuclear Aromatic Hydrocarbons*. The sampling train consisted of a 600-mg washed XAD-2 solid sorbent tube with a 2-micrometer (µm), 37- millimeter (mm) Teflon (PTFE) pre-filter connected to a low/high flow personal sampling pump (SKC). The unit was calibrated to collect approximately 250 liters per minute (L/min) of air through the filter and sorbent tube. Sampling was conducted for 24 hours with an approximate air volume of 360 cubic meters being collected.

Ambient air samples for dioxins were collected following US EPA Method TO-9, *Determination of Polychlorinated Dibenzo-p-Dioxin (PCDD) in Ambient Air*. Analysis was performed as per US EPA SW-846, *Test Methods for Evaluating Hazardous Waste* Method *8290, Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) by High-Resolution Gas Chromatography/High-Resolution Mass Spectroscopy (HRGC/HRMS)*. The samples were collected utilizing the General Metal Works (GMW) pesticide sampler (PS-1). The sampler was operated according to ERTC/REAC Standard Operating Procedure (SOP) #2121 *High Volume Polyurethane Foam Sampling*. The sampler was calibrated to collect approximately 200 L/min of air through the filter. Sampling was conducted for 24 hours with an approximate air volume of 288 cubic meters being collected.

Sampling and analyses for metals were conducted following a modified NIOSH Method 7300, *Elements (ICP)*. The sampling train consisted of a 0.8-µm pore size 37-mm mixed cellulose ester filter (MCEF) connected to a medium flow sampling pump (Gilian Aircon). The sampling pump was calibrated to collect approximately 8 to 10 L/min of air through the filter. Sampling was conducted for periods ranging from 8 to 24 hours with resulting air volumes of 3,840 to 14,400 liters over a 24-hour period.

Sampling and analysis for $PM_{2.5}$ and PM_{10} mass concentrations were conducted using FRM monitors, in accordance with Field SOP for the $PM_{2.5}$ FRM Performance Evaluation Program. A modification allowed the sample time to be less than 23 hours per sample (~approx. 21-22 hours per sample). The sampling interval spanned from late morning of the first day to late morning of the second day. The FRM samplers use Teflon filters, collecting 16.67 liters of air per minute.

All laboratory operations (filter weighing) were performed under an EPA contract per SOP for $PM_{2.5}$ Gravimetric Analysis.

Sampling and analysis for Speciated $PM_{2.5}$ were conducted using Spiral Ambient Speciation Sampler (SASS), per modified Volume 2 SOP for *Chemical Speciation of Particulate Matter*. The sampler uses five parallel sample cassettes sampling 7 liters of air per minute, each having its own size-selective $PM_{2.5}$ inlet, a denuder (if applicable), and a tandem filter holder. Three different types of filter media were used: Teflon (PTFE), Nylon, and Quartz. Teflon filters were analyzed by Inorganic Compendium Method IO-3.3 *Determination of Metals in Ambient Particulate Matter using X-Ray Fluorescence (XRF) Spectroscopy*, (EPA, 1997d) to characterize the elemental composition of the aerosol deposits. XRF analyses were performed by Chester LabNet in Tigard, Oregon.

Nylon filters were analyzed by Ion Chromatography (IC) to characterize aerosols that are soluble in water called aerosol ions. IC identifies both cations and anions. Quartz fiber filters were analyzed by thermal-optical instrumentation by the NIOSH Method 5040, *Elemental Carbon (Diesel Particulate)*, which reports total and major carbon fractions (organic, and elemental or light-absorbing carbon). Ion chromatography and carbon analyses were performed by the Research Triangle Institute located in Research Triangle Park, North Carolina.

Sampling and analysis for hexavalent chromium were conducted as per California Environmental Protection Agency Air Resources Board (CEPA-ARB) Method MLD 039, *Standard Operating Procedure for the Analysis of Hexavalent Chromium at Ambient Atmospheric Levels by Ion Chromatography*.

Sampling and analysis for mercury were conducted following a modified NIOSH Method 6009, *Mercury*. The sampling train consisted of a 200-mg hopcalite sorbent tube connected to a personal sampling pump (SKC). The sampling pump was calibrated to collect approximately 0.1 L/min of air through the sorbent tube. Sampling was conducted for 8 to 12 hours with a resulting air volume of 48 to 72 liters being collected.

Sampling and analysis for VOCs were conducted following modified (Gas Chromatography/Mass Spectrometry (GC/MS)) NIOSH methods: Method 1500, *Hydrocarbons, BP 36-126°C*; Method 1501, *Hydrocarbons, Aromatic*; and Method 1003, *Hydrocarbons, Halogenated*. The sampling train consisted of a 600-mg charcoal sorbent tube connected to a low/high flow personal sampling pump (Gillian or SKC). The sampling pump was calibrated to pull approximately 1 L/min of air through the sorbent tube. Sampling was conducted for 12 hours with a resulting air volume of 720 liters being collected.

All samples were packed along with chain of custody documentation. The carbon tube VOCs, metals, and mercury samples were shipped back to the REAC laboratory in Edison, NJ for analysis. The Summa canister VOCs, PAHs, and dioxin samples were shipped to the appropriate subcontracted laboratories for analysis. The hexavalent chromium air samples collected by RTP Associates were shipped to the California Environmental Protection Agency Air Resources

Board (CEPA-ARB) laboratory for analysis.

Weather data were obtained to support the meteorological needs of the ambient air sampling events and to document potential source impact. Meteorological monitoring was performed utilizing either one or two, 3-meter portable Met One Meteorological stations. The meteorological stations consist of a battery-operated tower that houses the core components of the station, including temperature, relative humidity, barometric pressure, wind speed, and wind direction sensors. The unit records data points internally or can communicate data to a base station via radio frequency.

The following U.S. EPA-ERTC/REAC SOPs were also used for air sampling:

1704	*Summa Canister Sampling*
1827	*Analysis of Mercury in Air with a Modified NIOSH 6009 Method*
2002	*Sample Documentation*
2003	*Sample Storage, Preservation and Handling*
2004	*Sample Packaging and Shipment*
2005	*Quality Assurance/Quality Control Samples*
2006	*Sampling Equipment Decontamination*
2008	*General Air Sampling Guidelines*
2103	*Charcoal Tube Sampling in Ambient Air*
2119	*Air Sampling for Metals (NIOSH Method 7300, Elements)*
2121	*High Volume Polyurethane Foam Sampling*
4005	*Chain of Custody Procedures*

Soil Sampling and Analysis Methods

Surface soil samples were collected from 0 to 6 inch depth levels at the soil sampling locations using clean scoops. The samples were placed in 4 ounce jars and sealed. Collected soil samples were analyzed for metals in accordance with SW-846, Method 7000A, *Atomic Absorption Methods*; Method 7471A, *Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)*; and Method 6010B, *Inductively Coupled Plasma-Atomic Emission Spectroscopy*. A representative portion was digested with acidic permanganate, cooled, treated with stannous chloride and analyzed for mercury on a Leeman Labs PS200II AA Spectrometer. Dioxin analysis was performed using SW-846, Method 8290A, *Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS)*.

Air Sampling Events

A phased sequence of air sampling was performed. Six sampling stations were utilized during the first three sampling rounds. The objective of these three rounds was to quantify the ambient air quality at and near the elementary school. Five of these locations were concentrated around the East Liverpool Elementary School. One was located along the Ohio River. The sampling locations for Sampling Rounds #1-3 were designated as EL-001 through EL-006.

Five sampling locations were selected for Sampling Round #4. These sampling locations were designated WTI-1 through WTI-5 and were intended to evaluate ambient air quality over a larger area in East Liverpool. A total of eight sampling locations were added during Sampling Round #5, one (WTI-3) was eliminated, for a total of 12 sampling locations. The added sampling locations were designated WTI-2A, WTI-5D, and WTI-6 through WTI-11, and expanded the area of investigation. Final sampling locations were selected in consultation with the US EPA Region 5. The ambient air sampling locations for all the sampling rounds are shown in Figure 2.

Sampling Rounds #1 and #2 consisted of three sampling events, each with duration of eight hours. Sampling and analyses were performed for VOCs, metals, and inorganic acids at all six sampling locations (EL-001 through EL-006). The sampling events were run sequentially, thereby covering a period of approximately 24 hours. The sampling locations and sampling events for Rounds #1 and #2 are summarized in Table 1. A map illustrating the sampling locations for Sampling Rounds #1-3 is shown in Figure 4. Pictures of the individual sampling locations are in Figures 5 through 10.

Sampling Round #3 consisted of four sampling events of about 24 hours duration each. Sampling and analyses were performed for metals at all six sampling locations (EL-001 through EL-006). The sampling locations and sampling events for Sampling Round #3 are summarized in Table 2.

Five sampling stations were utilized during the fourth sampling round. These locations were selected to provide a broader evaluation of ambient air quality in the area and to focus on identifying ambient concentrations of metals. Four sampling events of about 24- hour durations each were performed. One site was at the administration building of the school (WTI-1). Other sites included, East Liverpool Water Treatment Plant (WTI-2), the monitoring station operated by the WV DEP (as an indicator of background concentrations) (WTI-3), the roof of East Liverpool City Hall building (WTI-4), and the bank of the Ohio River at the end of Walter Street in East Liverpool (WTI-5). These sampling locations and sampling events are summarized in Table 3. The sampling locations are also presented in Figure 11. Pictures of the individual sampling locations are presented in Figures 12 through 16.

In an attempt to evaluate possible sources of metals, in particular chromium and manganese that had been identified during the previous sampling rounds as having relatively higher concentrations, the ambient air sampling locations were increased from 5 to 12 for Sampling Round #5. Eleven sampling events of approximately 12 hours each were carried out during the period December 4 -10, 2000. Four sampling stations were initially utilized during the fifth sampling round. These sampling locations included three previously used sites from Sampling Round #4, namely, the school administration building (WTI-1), the East Liverpool Water Treatment Plant (WTI-2), and the Walter Street Site (WTI-5). A new sampling location was added on December 4, 2000, the parking lot of the Columbiana County Port Authority (WTI-6).

Four additional sampling locations were added on December 5, 2000. One located to the west of

Ohio Avenue (WTI-7) and three sampling locations positioned near the S. H. Bell Company location in Pennsylvania (WTI-8-10). Four more sampling locations were added on December 6, 2000, for a total of 12 sampling locations. These locations included a duplicate sample at the WTI-5 site (WTI-5D), an additional location at the East Liverpool Water Treatment Plant (WTI-2A), an additional location in Pennsylvania, east of S. H. Bell Company (WTI-11) and a return to the East Liverpool City Hall roof site (WTI-4).

Sampling and analysis was performed for metals at all 12 locations and for VOCs at four locations. These sampling events are summarized in Table 4. Figure 17 depicts the air sampling locations for Sampling Round #5. Pictures of the additional Round #5 sampling locations are presented in Figures 18 through 24.

Soil Sampling Events

To supplement the air sampling data and provide additional information on the historical ambient impacts in the area, soil sampling was performed during Sampling Rounds #1 and #4. Consistent with the air sampling in Round #1, soil sampling was concentrated near the elementary school. Nine sampling locations were selected on the school property and the tenth was on the air sampling location along the Ohio River off Ohio Avenue (air sampling location EL-006). Surface soil sampling was performed on October 26, 2000. The soil sampling locations for Round #1 are listed in Table 5 and shown in Figure 25. Pictures of the individual sampling locations are located in Figures 26 -35.

Previous to ERTC involvement at the site, Save our County (SAC), a local environmental group had conducted soil sampling and analysis at the school property. SAC's results differed from the ERTC round 1 results. However, since the two sets of samples were taken at different locations within the school property, and employed different analytical methods, a comparison between the two sets of sample results could not be made. To alleviate this problem another set of soil samples was taken during air sampling round 4. These samples were taken by ERTC at two locations on school property identified by a representative of SAC as the locations originally sampled by SAC. In addition two other locations were sampled for a total of four locations on the school property. At each of the four locations, spoonfuls of soil were alternately placed into two jars; one jar was maintained by ERTC, and one jar was given to the SAC representative with a signed chain of custody. Due to public concern about the Walter Street site (WTI-5) an additional three samples (one duplicate) were collected there. SAC did not request a split of the Walter Street samples. The soil sampling locations for Round #4 are listed in Table 6 and in Figure 36. Pictures of these locations are presented in Figures 37 through 41.

Meteorological Data Monitoring

Meteorological data monitoring was conducted during Sampling Rounds #2, #4, and #5. The locations for Sampling Round #2 were on the roof of the East Liverpool Elementary School near Air Sampling Location EL-002 and at Air Sampling Location EL-006. The meteorological monitors were located on the roof of the East Liverpool Administration Building (Air Sampling

Location WTI-1), and at the East Liverpool Water Treatment Plant (Air Sampling Location WTI-2) for Sampling Rounds # 4 and #5. Monitoring was performed with Met One Instruments Portable Weather Station, which included a 3-meter tower, wind sensor, temperature/humidity sensor with shield, barometric pressure sensor, solar radiometer, and rain gauge. All data were collected on the AutoMet 466A Data Logger. Communications for remote download were available using a 900-MHz Spread Spectrum Radio modem system via an RS-232 link. Supplemental power was supplied from a power system that uses a solar panel. Where possible AC power was used.

Quality Assurance

All analyses were performed in accordance with the standard EPA, ASTM, and NIOSH test methods with some modifications to flow rates and duration to improve sensitivity and detection limits. Internal standard, surrogate compounds, blank samples and applicable matrix spike/matrix spike duplicate (MS/MSD) samples were used to verify the quality of the analytical data. All the pertinent information regarding sampling and analysis were recorded in appropriate logbooks and/or data sheets. A Quality Assurance Project Plan (QAPP) was developed by OAQPS and followed for ambient air sampling activities conducted during Sampling Round #4 (Emission Testing) sampling.

The following Quality Assurance/Quality Control Protocols are applicable to all sample matrices results:

1 Sample documentation in the form of field logbooks, appropriate field data sheets, and chain of custody forms were provided. Chain-of-custody sheets are optional for field screening locations.
2 All instrument calibration and/or performance check procedures/methods were summarized and documented in the field/personal or instrument log notebook.
3 Detection limit(s) were determined and recorded, along with the data, where appropriate.
4 Sample holding times were documented; this includes documentation of sample collection and analysis dates.
5 Initial and continuing instrument calibration data were provided.
6 For air samples, lot blanks, field blanks, collocated samples, trip blanks, and breakthrough samples were included at the rate specified in attached tables.
7 Analyte identifications - Analyte identification on 10 percent of the screened (field or lab) or 100 percent of the unscreened samples were confirmed using a US EPA-approved method; documentation such as chromatograms, mass spectra, etc. were provided.
8 Quantitation - Documentation for quantitative results from screening and US EPA-approved verification methods (for screened samples) or quantitative results (in the case of unscreened samples) were provided.

Results and Discussion for Ambient Air

Air samples were analyzed for VOCs in air by Air Toxics, Ltd. using US EPA Method TO-14, metals in air using a modified NIOSH Method 7300 by REAC, and inorganic acids in air by Galson Laboratories using NIOSH Method 7903. These results indicate that the VOC and metal ambient air concentrations are at or below the levels monitored by the state agencies in urban areas of Ohio and Pennsylvania. Tables 7 through 9 present the detected concentrations of VOCs, metals, and inorganic acids for the initial air sampling conducted on October 25 - 27, 2000.

The first round of ambient air monitoring was conducted between October 25-27, 2000. Results for chromium (ND-1.3 $\mu g/m^3$) in Round 1 of the testing were slightly higher than observed previously by the Ohio EPA. Ambient air sampling of this area during 1993-1995 and 1999-2000 showed the presence of chromium between ND and 0.09 $\mu g/m^3$. Manganese results (ND-3.0 $\mu g/m^3$) were in the same range as seen in the Ohio EPA air sampling in this area during 1999 and 2000 (0.3 to 3.29 $\mu g/m^3$).

Metals analyses using EDXRF on the $PM_{2.5}$ and PM_{10} mass samples confirmed similar readings to those described in the above paragraph on the PM_{10} filters (chromium 4.4 and 2.8 $\mu g/m^3$, manganese (62 and 9.2 $\mu g/m^3$) but not on the $PM_{2.5}$ filters. Levels for chromium and manganese on the $PM_{2.5}$ filters were less than 1 $\mu g/m^3$, clearly linking these metal concentrations with the coarse particle size fraction (2.5 - 10 μ). Coarse particles typically are associated with mechanically generated processes, whereas particles less than 2.5 μ more often are associated with combustion processes. The observed chromium levels led to sampling and analysis for hexavalent chromium during Sampling Round #4.

Results for the second round of air sampling performed on November 1 and 2, 2000 are presented in Tables 10 through 12. Air samples were analyzed for VOCs, metals, and inorganic acids as described for Round #1. All concentrations were within typical ambient air quality levels for urban areas, except for manganese. Manganese was detected in several samples with the highest concentrations of 2.4 $\mu g/m^3$ near the school (location EL-002), and 7.3 $\mu g/m^3$ at location EL-006 (Ohio River Bank). Chromium was not detected during the second round of sampling.

Table 13 summarizes the detected concentrations for Sampling Round #3, performed on November 6 - 8, 10 and 11. The focus of this sampling round was metals, which were collected over a 24-hour period and analyzed in accordance with NIOSH Method 7300 by REAC. Manganese continued to be detected near a house adjacent to the school (location EL-004), at concentrations up to 4.1 $\mu g/m^3$, and near the river, up to 22 $\mu g/m^3$ at location EL-006. Chromium was also detected near the school, the highest concentrations being 0.11 $\mu g/m^3$ and up to 0.16 $\mu g/m^3$ was detected near the river at location EL-006.

Results for dioxins, PAHs, metals and VOCs for samples from Sampling Round #4 (November 13-17, 2000) are summarized in Tables 14 through 17. Dioxin and furans analysis results from

this sampling event are reported in the Table 14 in terms of actual concentration and in Table 18 as toxicity equivalent values (TEQ). The TEQ values are obtained by multiplying results for each compound by a weighting factor based on the relative toxicities of each compound. Typical dioxin levels (expressed as total TEQs values) for several locations around the world are presented in Table 19. Low levels of dioxins (0.008-0.097 pg/m^3 TEQ) were detected at sampling locations WTI-1, WTI-2, and WTI-3, except for 2.370 pg/m^3 TEQ at WTI-2 on November 16, and 2.201 pg/m^3 TEQ at location WTI-5 on November 15.

Dioxins and furans are short collective designations for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Both are tricyclic, chlorine-substituted, organic compounds belonging to a class of chemicals called organochlorines. In these compounds the chlorine atoms are attached to specific carbon atoms in an identical carbon-oxygen framework. The number of chlorine substituents may range from one to eight, which means 75 possible PCDD congeners ("members of the group") and 135 possible PCDF congeners.

Combustion processes, where fuel containing both carbon and chlorine are present, can produce a wide range of dioxin/furan compounds. Operations, such as incinerators and other industrial combustion sources, home fireplaces, wood burning stoves, burn barrels, and diesel fuel combustion could also produce dioxins. All of these potential sources are in the area of sampling locations WTI-2 and WTI-5, and could be the source(s) of the higher values recorded on November 15 and 16.

Concentrations of PAHs, VOCs and most of the metals detected in Sampling Round #4 were within typical ambient air quality levels for urban air, with the exception of chromium. Chromium was detected at a concentration of 5.8 μg/m^3 on November 16 at Sampling Location WTI-2, the Water Treatment Plant. Manganese was also detected on November 16, at a concentration of 9.5 μg/m^3 at the WTI-2 sampling location and up to 1.7 μg/m^3 at the Walter Street site (WTI-5 sampling location) (Table 16). The WTI-5 sampling site is along the Ohio River.

PM_{10} and $PM_{2.5}$ mass results ranged from 10.5 to 25.6 μg/m^3, with 16 - 76 percent of the mass located in the $PM_{2.5}$ fraction. Most samples ranged between 50 and 75 percent, which is typical for larger spatial scale characteristics for the greater Ohio-Pennsylvania-West Virginia region. EDXRF metals analyses on PM_{10} filters indicated chromium concentrations of 18 μg/m^3 at site WTI-2 on sampling periods November 15-16 and 2.2 μg/m^3 on November 13-14. A manganese concentration of 3.4 μg/m^3 was observed at sampling site WTI-2 on November 15-16. Chromium (0.74 and 0.69 μg/m^3) and manganese (0.45 and 1.2 μg/m^3) were observed in the Walter street sampling site (WTI- 5) samples from November 15-17. While these concentrations were higher than other measurements, they are reasonably consistent with historical data from this area, and also, reasonably consistent with the Ohio EPA measurements of other urban locations.

Most of the hexavalent chromium data indicated levels below non detection, the highest estimated value of 1.58 ng/m^3 was observed at sampling site WTI-2 (Water Treatment Plant) on November 15-16. These data clearly indicate that the relatively high total chromium concentration contained an extremely small fraction (less than 0.1 percent) of hexavalent chromium.

Chemical speciation results (Table 20, Figure 42) for $PM_{2.5}$ fraction exhibit fairly typical composition patterns for the region, dominated by sulfates, carbon and nitrate. The relatively elevated level of elements at the water treatment site with respect to the other site locations is indicative of a localized source that is likely contributing to the same elevated levels of chromium and manganese observed in the PM_{10} fraction. With the exception of the Water Treatment Plant site (WTI-2), the composition at all sites was comparable to that observed at the background Lawrenceville, West Virginia site.

The methylene chloride concentration detected at sampling location WTI-5 on November 16 was 1200 ppbv (Table 17). All other detected concentrations of methylene chloride at all locations were significantly lower (1.8 - 59ppbv).

Table 21 summarizes the analytical results for metals from samples taken during Sampling Round #5 (December 5-10, 2000). These results indicate that the ambient concentrations of metals were at levels typically found in urban air. Chromium results ranged from ND - 0.59 μg/m^3. Manganese was observed in the range of ND - 3.9 μg/m^3, except at Location WTI-5 where up to 8.9 μg/m^3 of manganese was detected. The remaining metals were detected within concentrations typically found in urban air. Mercury was not detected in any of the samples.

Results for VOC analysis from Sampling Round #5 are summarized in Table 22. Only 8 out of 44 samples collected showed concentrations above the method detection limit (MDL). These samples indicated the presence of two VOCs, one sample contained both benzene and toluene, whereas the other seven contained only toluene. These nine concentrations were less than 1 ppbv. The samples were analyzed for a total of 46 VOCs.

Results and Discussion for Soil Samples

Tables 23, 24, 25, and 26 summarize the metals and dioxins results in soil for Sampling Round #1 and #4. Soil sampling was performed on October 26 (school playground) and on November 15 (in front of school and Walter Street). Levels of dioxins detected in the soil samples were low and similar to the background levels detected in the United States.

The results for most metals detected are comparable to the background levels observed in rural to light industrial areas of the eastern United States. However, some slightly above typical background levels of arsenic and zinc were found around the school and slightly elevated levels of chromium and zinc were found at the Walter Street sampling location. Although other metals were also detected, they generally consisted of expected levels of metals, such as calcium and sodium.

Results and Discussion for Meteorological Data

Wind rose plots representing the frequency and speed of winds blowing from the various compass directions for each of the sampling events are located in Figures 42 through 63. The wind roses show variability depending upon the location of the monitor. Even though the monitors were located in the river valley area, there was no consistent pattern of wind flow among the three locations used. In addition, although there was a pattern of east-west wind flow direction consistent with the river valley, the frequency of the wind pattern varied with monitor location. The EL-002 and WTI-1 sampling locations were at higher elevations in the river valley area than the WTI-2 sampling location. This difference in elevation was sufficient to cause wind flow variation between the higher and lower elevation monitoring locations.

Potential sources of air pollution impacting the area where the air sampling sites were located include the WTI incinerator with fugitive ground level and stack release emissions and several industrial operations with potential fugitive releases at ground level.

Conclusions

The results of the ambient air and surface soil sampling conducted in the East Liverpool area generally revealed concentrations of contaminants of concern in ranges typical of urban areas, including the presence of manganese and chromium at certain locations. Due to the valley effect, meteorological data were inconclusive and the source(s) of the elevated concentrations of chromium and manganese could not be traced conclusively.

The analytical results were provided to ATSDR for their health evaluation and the preliminary health evaluation performed by ATSDR is attached in Appendix A.

References

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Tables

Table 1
Ambient Air Sampling
Sampling Rounds #1 and 2

SAMPLE NUMBER	SAMPLING DATE / TIME	VOCs SAMPLE DURATION (MINUTES)	METALS SAMPLE DURATION (MINUTES)	INORGANIC ACIDS SAMPLE DURATION (MINUTES)
Event #1-1				
EL-001	25 Oct 00 / 1628-2428	480	480	480
EL-002	25 Oct 00 / 1620-2420	480	480	480
EL-003	25 Oct 00 / 1634-2434	480	480	480
EL-004	25 Oct 00 / 1641-2441	480	480	480
EL-005	25 Oct 00 / 1651-2451	370	480	480
EL-006	25 Oct-00 / 1710-0110	480	480	480
Event #1-2				
EL-001	26 Oct 00 / 0626-1426	150	480	480
EL-002	26 Oct 00 / 0619-1419	480	480	480
EL-003	26 Oct 00 / 0631-1431	480	480	480
EL-004	26 Oct 00 / 0636-1436	480	480	374
EL-005	26 Oct 00 / 0648-1448	381	480	480
EL-006	26 Oct 00 / 0655-1455	480	480	480
Event #1-3				
EL-001	26-27 Oct 00 / 2254-0654	480	480	480
EL-003	26-27 Oct 00 / 2255-0655	353	480	480
EL-004	26-27 Oct 00 / 2300-0700	480	480	480

Location:
EL-001 Elementary School at SW Corner
EL-002 Elementary School at Entrance
EL-003 Backyard of E House on Etruria Street
EL-004 Side yard of C House on Etruria Street near garage
EL-005 Elementary School Playground
EL-006 Bank of Ohio River across from 1911 Ohio Avenue

Table 1 (continued)
Ambient Air Sampling
Sampling Rounds #1 and 2

SAMPLE NUMBER	SAMPLING DATES	VOCs SAMPLE DURATION (MINUTES)	METALS SAMPLE DURATION (MINUTES)	INORGANIC ACIDS SAMPLE DURATION (MINUTES)
Event #2-1				
EL-001	1 Nov 00	480	480	480
EL-002	1 Nov 00	480	480	480
EL-003	1 Nov 00	345	480	480
EL-004	1 Nov 00	480	480	480
EL-005	1 Nov 00	330	480	480
EL-006	1 Nov 00	480	480	480
Event #2-2				
EL-001	1-2 Nov 00	480	480	480
EL-002	1-2 Nov 00	480	480	480
EL-003	1-2 Nov 00	480	480	480
EL-004	1-2 Nov 00	244	480	480
EL-005	1-2 Nov 00	480	480	480
EL-006	1-2 Nov 00	480	480	480
Event #2-3				
El-001	2 Nov 00	480	480	480
EL-002	2 Nov 00	480	480	480
EL-003	2 Nov 00	477	480	374
EL-004	2 Nov 00	480	480	480
EL-005	2 Nov 00	480	Pump Failure	399
EL-006	2 Nov 00	480	480	480

Location:
EL-001 Elementary School at SW Corner
EL-002 Elementary School at Entrance
EL-003 Backyard of E House on Etruria Street
EL-004 Side yard of C House on Etruria Street near garage
EL-005 Elementary School Playground
EL-006 Bank of Ohio River across from 1911 Ohio Avenue

Table 2
Ambient Air Sampling
Sampling Round #3

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION (MINUTES)
Event #3-1		
EL-001	6-7 Nov 00	1237
EL-002	6-7 Nov 00	1237
EL-003	6-7 Nov 00	1206
EL-004	6-7 Nov 00	703
EL-005	6-7 Nov 00	1257
EL-006	6-7 Nov 00	1159
Event #3-2		
EL-001	7-8 Nov 00	1488
EL-002	7-8 Nov 00	1342
EL-003	7-8 Nov 00	1355
EL-004	7-8 Nov 00	1178
EL-005	7-8 Nov 00	1302
EL-006	7-8 Nov 00	1278
Event #3-3		
EL-001	10-11 Nov 00	1250
EL-002	10-11 Nov 00	1256
EL-003	10-11 Nov 00	1269
EL-004	10-11 Nov 00	124
EL-005	10-11 Nov 00	1272
EL-006	10-11 Nov 00	1240
Event #3-4		
EL-001	11-12 Nov 00	1475
EL-002	11-12 Nov 00	1439
EL-003	11-12 Nov 00	1439
EL-004	11-12 Nov 00	930
EL-005	11-12 Nov 00	1444
EL-006	11-12 Nov 00	1156

Location:
EL-001 Roof of Administration Building
EL-002 Elementary School at Entrance
EL-003 Backyard of E House on Etruria Street
EL-004 Side yard of C House on Etruria Street near garage
EL-005 Elementary School Playground
EL-006 Bank of Ohio River across from 1911 Ohio Avenue

Table 3
Ambient Air Sampling
Sampling Round #4

SAMPLE NUMBER	SAMPLING DATE / TIMES	DIOXIN SAMPLE DURATION (MINUTES)	PAH SAMPLE DURATION (MINUTES)	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #4-1					
WTI-1	13 Nov 00 @ 1620- 14 Nov 00 @ 1608	1413	1428	1390	1405
WTI-2	13 Nov 00 @ 1336- 14 Nov 00 @ 1424	1488	1474	1420	1440
WTI-3	13 Nov 00 @ 1655- 14 Nov 00 @ 1518	1313	1338	1316	1340
WTI-4	Not Sampled	--	--	--	--
WTI-5	13 Nov 00 @ 1434- 14 Nov 00 @ 1657	--	--	1017	1540
Event #4-2					
WTI-1	14 Nov 00 @ 1537- 15 Nov 00 @ 1656	1502	1488	Sample not analyzed*	1497
WTI-2	14 Nov 00 @ 1410- 15 Nov 00 @ 1422	1439	1438	1440	1469
WTI-3	14 Nov 00 @ 1451- 15 Nov 00 @ 1504	1427	1427	1451	1431
WTI-4	14 Nov 00 @ 1620- 15 Nov 00 @ 1608	--	--	--	1640
WTI-5	14 Nov 00 @ 1114- 15 Nov 00 @ 1657	832	832	839	--

*Sample fell during sampling period and was contaminated.

Location:
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-3 West Virginia DEP site, Lawrenceville, WV
WTI-4 Roof of East Liverpool City Hall
WTI-5 End of Walter Street

Table 3 (continued)
Ambient Air Sampling
Sampling Round #4

NUMBER	SAMPLING DATE / TIMES	DIOXIN SAMPLE DURATION (MINUTES)	PAH SAMPLE DURATION (MINUTES)	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #4-3					
WTI-1	15 Nov 00 @ 1706- 16 Nov 00 @ 1637	1409	1411	1409	Grab
WTI-2	15 Nov 00 @ 1434- 16 Nov 00 @ 1453	1457	1458	1458	1447
WTI-3	15 Nov 00 @ 1519- 16 Nov 00 @ 1530	1450	1450	1399	1450
WTI-4	15 Nov 00	--	--	--	Grab
WTI-5	15 Nov 00 @ 1630- 16 Nov 00 @ 1619	--	--	831	1429
Event #4-4					
WTI-1	16 Nov 00 @ 1643- 17 Nov 00 @ 1549	1386	1386	1386	Grab
WTI-2	16 Nov 00 @1458- 17 Nov 00 @1443	1424	1424	1425	-
WTI-3	16 Nov 00 @1535- 17 Nov 00 @1530	1428	1428	1435	-
WTI-4	16 Nov 00	-	-		Grab
WTI-5	16 Nov 00 @1619- 17 Nov 00 @1515	1376	1376	780	-

Location:
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-3 West Virginia DEP site, Lawrenceville, WV
WTI-4 Roof of East Liverpool City Hall
WTI-5 End of Walter Street

Table 4
Ambient Air Sampling
Sampling Round #5

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION	VOCs SAMPLE DURATION (MINUTES)
Event #5-1			
WTI-1	4-5 Dec 00	746	720
WTI-2	4-5 Dec 00	757	720
WTI-5	4-5 Dec 00	10	720
WTI-6	4-5 Dec 00	489	720
Event #5-2			
WTI-1	5 Dec 00	635	634
WTI-2	5 Dec-00	632	631
WTI-5	5 Dec 00	634	635
WTI-6	5 Dec 00	609	610
Event #5-3			
WTI-1	5-6 Dec	720	714
WTI-2	5-6 Dec	718	155
WTI-5	5-6 Dec	184	713
WTI-6	5-6 Dec	352	711
WTI-7	5-6 Dec 00	720	
WTI-8	5-6 Dec 00	720	
WTI-9	5-6 Dec 00	720	
WTI-10	5-6 Dec 00	720	
Event #5-4			
WTI-1	6 Dec 00	725	720
WTI-2	6 Dec 00	724	720
WTI-5	6 Dec 00	725	720
WTI-6	6 Dec 00	510	720
WTI-7	6 Dec 00	720	
WTI-8	6 Dec 00	720	
WTI-9	6 Dec 00	720	
WTI-10	6 Dec 00	720	

Location:
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-5 End of Walter Street
WTI-6 Port Authority Parking Area
WTI-7 West End of Ohio Avenue
WTI-8 Route 39 E at Monument
WTI-9 Route 39 E at Entrance
WTI-10 East End of S. H. Bell

Table 4 (continued)
Ambient Air Sampling
Sampling Round #5

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #5-5			
WTI-1	6-7 Dec 00	726	720
WTI-2	6-7 Dec 00	730	720
WTI-2A	6-7 Dec 00	720	
WTI-4	6-7 Dec 00	720	
WTI-5	6-7 Dec 00	535	720
WTI-5D	6-7 Dec 00	720	
WTI-6	6-7-Dec 00	720	720
WTI-7	6-7 Dec 00	0	
WTI-8	6-7 Dec 00	720	
WTI-9	6-7 Dec 00	720	
WTI-10	6-7 Dec 00	720	
WTI-11	6-7 Dec 00	720	
Event #5-6			
WTI-1	7 Dec 00	720	720
WTI-2	7 Dec 00	714	713
WTI-2A	7 Dec 00	717	
WTI-4	7 Dec 00	720	
WTI-5	7 Dec 00	221	717
WTI-5D	7 Dec 00	717	
WTI-6	7 Dec 00	325	720
WTI-7	7 Dec 00	720	
WTI-8	7 Dec 00	26	
WTI-9	7 Dec 00	720	
WTI-10	7 Dec 00	720	
WTI-11	7-Dec 00	356	

Location:
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-2A PM_{10} Location at Water Treatment Plant
WTI-4 East Liverpool City Hall Roof
WTI-5 End of Walter Street
WTI-5D Walter Street Duplicate
WTI-6 Port Authority Parking Area
WTI-7 West End of Ohio Avenue
WTI-8 Route 39 E at Monument
WTI-9 Route 39 E at Entrance
WTI-10 East End of S. H. Bell
WTI-11 Cause Ave. at East end of S. H. Bell

Table 4 (continued)
Ambient Air Sampling
Sampling Round #5

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #5-7			
WTI-1	7-8 Dec 00	711	712
WTI-2	7-8 Dec 00	720	720
WTI-2A	7-8 Dec 00	720	
WTI-4	7-8 Dec 00	705	
WTI-5	7-8 Dec 00	714	715
WTI-5D	7-8 Dec 00	715	
WTI-6	7-8 Dec 00	492	706
WTI-7	7-8 Dec 00	720	
WTI-8	7-8 Dec 00	720	
WTI-9	7-8 Dec 00	720	
WTI-10	7-8 Dec 00	720	
WTI-11	7-8 Dec 00	720	
Event #5-8			
WTI-1	8 Dec 00	694	694
WTI-2	8 Dec 00	692	693
WTI-2A	8 Dec 00	692	
WTI-4	8 Dec 00	698	
WTI-5	8 Dec 00	682	691
WTI-5D	8 Dec 00	690	
WTI-6	8 Dec 00	694	694
WTI-7	8 Dec 00	690	
WTI-8	8 Dec 00	693	
WTI-9	8 Dec 00	694	
WTI-10	8 Dec 00	695	
WTI-11	8 Dec 00	693	

Location
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-2A PM_{10} Location at Water Treatment Plant
WTI-4 East Liverpool City Hall Roof
WTI-5 End of Walter Street
WTI-5D Walter Street Duplicate
WTI-6 Port Authority Parking Area
WTI-7 West End of Ohio Avenue
WTI-8 Route 39 E at Monument
WTI-9 Route 39 E at Entrance
WTI-10 East End of S. H. Bell
WTI-11 Cause Ave. at East end of S. H. Bell

Table 4 (continued)
Ambient Air Sampling
Sampling Round #5

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #5-9			
WTI-1	8-9 Dec 00	737	219
WTI-2	8-9 Dec 00	742	720
WTI-2A	8-9 Dec 00	720	
WTI-4	8-9 Dec 00	720	
WTI-5	8-9 Dec 00	328	720
WTI-5D	8-9 Dec 00	738	
WTI-6	8-9 Dec 00	159	720
WTI-7	8-9 Dec 00	720	
WTI-8	8-9 Dec 00	720	
WTI-9	8-9 Dec 00	720	
WTI-10	8-9 Dec 00	720	
WTI-11	8-9 Dec 00	720	
Event #5-10			
WTI-1	9 Dec 00	705	705
WTI-2	9 Dec 00	701	701
WTI-2A	9 Dec 00	702	
WTI-4	9 Dec 00	703	
WTI-5	9 Dec 00	570	702
WTI-5D	9 Dec 00	700	
WTI-6	9 Dec 00	653	704
WTI-7	9 Dec 00	700	
WTI-8	9 Dec 00	700	
WTI-9	9 Dec 00	701	
WTI-10	9 Dec 00	702	
WTI-11	9 Dec 00	701	

Location
WTI-1 Roof of Administration Building
WTI-2 Water Treatment Plant
WTI-2A PM_{10} Location at Water Treatment Plant
WTI-4 East Liverpool City Hall Roof
WTI-5 End of Walter Street
WTI-5D Walter Street Duplicate
WTI-6 Port Authority Parking Area
WTI-7 West End of Ohio Avenue
WTI-8 Route 39 E at Monument
WTI-9 Route 39 E at Entrance
WTI-10 East End of S. H. Bell
WTI-11 Cause Ave. at East end of S. H. Bell

Table 4 (continued)
Ambient Air Sampling
Sampling Round #5

SAMPLE NUMBER	SAMPLING DATES	METALS SAMPLE DURATION (MINUTES)	VOCs SAMPLE DURATION (MINUTES)
Event #5-11			
WTI-1	9-10 Dec 00	717	720
WTI-2	9-10 Dec 00	715	717
WTI-2A	9-10 Dec 00	720	
WTI-4	9-10 Dec 00	720	
WTI-5	9-10 Dec 00	676	720
WTI-5D	9-10 Dec 00	720	
WTI-6	9-10 Dec 00	720	720
WTI-7	9-10 Dec 00	720	
WTI-8	9-10 Dec 00	720	
WTI-9	9-10 Dec 00	718	
WTI-10	9-10 Dec 00	711	
WTI-11	9-10 Dec 00	720	

Location	WTI-1	Roof of Administration Building
	WTI-2	Water Treatment Plant
	WTI-2A	PM_{10} Location at Water Treatment Plant
	WTI-4	East Liverpool City Hall Roof
	WTI-5	End of Walter Street
	WTI-5D	Walter Street Duplicate
	WTI-6	Port Authority Parking Area
	WTI-7	West End of Ohio Avenue
	WTI-8	Route 39 E at Monument
	WTI-9	Route 39 E at Entrance
	WTI-10	East End of S. H. Bell
	WTI-11	Cause Ave. at East end of S. H. Bell

Table 5
Soil Sampling
Sampling Round #1

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLING DATE
EES-1	SW Corner of School	October 26, 2000
EES-2	School Entrance	October 26, 2000
EES-3	SE Corner of School	October 26, 2000
EES-4	Playground Swing Set	October 26, 2000
EES-5	Playground Ladder	October 26, 2000
EES-6	Bottom of Slide	October 26, 2000
EES-7	W Side Snack Shack	October 26, 2000
EES-8	Home Base	October 26, 2000
EES-9	Center Field	October 26, 2000
EES-10	Bank of Ohio River	October 26, 2000

Table 6
Soil Sampling
Sampling Round #4

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLING DATE
SE-1	SE Corner of School	November 15, 2000
SE-2	SW Corner of School	November 15, 2000
SE-3	Front of School	November 15, 2000
SE-4	School Entrance	November 15, 2000
WTI-5	End of Walter Street	November 15, 2000

TABLE 7
SUMMARY TABLE FOR VOCs DETECTED IN AIR - ROUND #1
Dates Sampled October 25-27, 2000

Sample Number		29376	23831	23574	29375	23830	29377	23832	23575	29378	23833	23576	29379	23834	29388	23851	
Sampling Location		**EL-001**	**EL-001**	**EL-001**	**EL-002**	**EL-002**	**EL-003**	**EL-003**	**EL-003**	**EL-004**	**EL-004**	**EL-004**	**EL-005**	**EL-005**	**EL-006**	**EL-006**	
Date Sampled		**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**25-Oct**	**26-Oct**	
Volume (Liters)		**480**	**150**	**480**	**480**	**480**	**480**	**480**	**353**	**480**	**480**	**480**	**370**	**381**	**480**	**480**	
		Concentration in parts per billion by volume (ppbv)															
Compound	**Range**																**MDL***
1,1,1,-Trichloroethane	ND-0.49J					0.38 J		0.49 J			0.46			0.4 J		0.42 J	0.8
Benzene	ND-2.1J	1.2 J	2.1 J		1.2 J	1.1 J	1.2 J	1.2 J	0.9 J	1.2 J	1.3	0.79 J	1.9	1.4 J	1.2 J	0.9 J	1.3
n-Heptane	ND-0.71J	0.71 J			0.39 J					0.3 J		0.27 J	0.71 J				0.9
Trichloroethene	ND-0.2J					0.18 J		0.2 J								0.17 J	0.7
Methylcyclohexane	ND-0.77J	0.77 J			0.33 J		0.6 J					0.2 J					0.9
Toluene	ND-5.5	2.6	2.6 J		3.0	1.7	3.0	1.8	2.3	5.5	2.0	2.3	4.7	5.4	2.2	1.2	1.1
Tetrachloroethene	ND-0.13J										0.13 J						0.6
Ethylbenzene	ND-0.36J						0.32 J			0.36 J							0.9
p-Xylene	ND-2.1	1.0			1.1	0.6 J	1.1	0.64 J	0.9 J	1.4	0.69 J	0.85 J	2.1	0.9 J	0.87 J	0.4 J	0.9
o-Xylene	ND-0.5J	0.37 J						0.21J		0.5 J				0.34 J	0.32 J		1.0
Mesitylene	ND-0.5J									0.5 J							0.8
D-Limonene	ND-0.83J				0.2 J					0.59 J				0.83 J			0.7

Sample Number		29362	29361	29363	29364	29365	29366	29367	29368	29360
Sampling Location		**EL001**	**EL002**	**EL003**	**EL004**	**EL005**	**EL006**	**EL007**	**EL008**	**onsite after hours**
Date Collected		**26-Oct**	**26-Oct**	**26-Oct**	**26-Oct**	**26-Oct**	**26-Oct**	**26-Oct**	**26-Oct**	**24-Oct**
		Concentration in parts per billion by volume (ppbv)								
Compound	**Range**									
Freon 12	ND-0.79		0.78	0.76	0.78	0.72	0.79	0.69	0.78	0.73
Chloromethane	0.69-1.1	0.77	0.74	0.78	0.99	0.84	0.79	0.69	1.1	0.74
Benzene	0.71-1.9	1	1.1	0.93	1.9	1.2	0.71	0.78	0.73	0.72
Toluene	1.1-3.6	1.8	2.8	1.8	3.6	2.4	1.1	1.6	1.5	1.1
m,p-Xylene	ND-1.9		0.92		1.9	0.82				
1,2,4-Trimethylbenzene	ND-0.75				0.75					
Total TICs	37.7-67.3	52.3	67.3	56.9	62.3	57	37.7	50.8	47	55.5

MDL: Method Detection Limit
J: The value is below the method detection limit and is estimated
*: MDL based on 480 Liters of sample volume
TICs: Tentatively Identified Compounds

Sampling Locations:

EL-001	Elementary School at SW Corner
EL-002	Elementary School at Entrance
EL-003	Backyard of E House on Etruria Street
EL-004	Side yard of C House on Etruria Street near garage
EL-005	Elementary School Playground
EL-006	Bank of Ohio River across from 1911 Ohio Avenue

TABLE 8
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #1
Dates Sampled October 25-27, 2000

Sample Number		**29371**	**23786**	**23570**	**29370**	**23785**	**29372**	**23787**	**23571**	**29373**	**23788**	**23572**	**29374**	**23789**	**29385**	**23838**	
Sampling Location		**EL-001**	**EL-001**	**EL-001**	**EL-002**	**EL-002**	**EL-003**	**EL-003**	**EL-003**	**EL-004**	**EL-004**	**EL-004**	**EL-005**	**EL-005**	**EL-006**	**EL-006**	
Date Sampled		**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**27-Oct**	**25-Oct**	**26-Oct**	**25-Oct**	**26-Oct**	
Volume (Liters)		**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	
		Concentration in microgram/cubic meter (µg/m^3)															
Metal	**Range**																**MDL***
Calcium	ND-6.0					6.0											5.2
Chromium	ND-1.3		1.3			0.67		0.98			1.0			0.30	0.27		0.26
Iron	ND-6.4	1.3	5.3		1.5	5.9	1.5	5.0	1.6		6.4	1.6	2.1	5.5	3.4	4.0	1.3
Lead	ND-0.3	0.14	0.15			0.14	0.16	0.18		0.30	0.19	0.11	0.11	0.28	0.14	0.10	0.10
Manganese	ND-3.0		1.6	0.33		2.2		1.5	0.42		3.0	0.56		0.97	0.36	2.0	0.26
Zinc	ND-2.2		0.62					1.1	2.2		0.84						0.52

MDL: Method Detection Limit
*: MDL based on 480 Liters of sample volume
Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Locations:

EL-001 Elementary School at SW Corner
EL-002 Elementary School at Entrance
EL-003 Backyard of E House on Etruria Street
EL-004 Side yard of C House on Etruria Street near garage
EL-005 Elementary School Playground
EL-006 Bank of Ohio River across from 1911 Ohio Avenue

TABLE 9
SUMMARY TABLE FOR INORGANIC ACIDS DETECTED IN AIR - ROUND #1
Dates Sampled October 25 - 27, 2000

Sample Number		**29381**	**23781**	**23578**	**29380**	**23780**	**29382**	**23782**	**23579**	**29383**	**23783**	**23580**	**29384**	**23784**	**29391**	**23835**	
Sampling Location		**EL-001**	**EL-001**	**EL-001**	**EL-002**	**EL-002**	**EL-003**	**EL-003**	**EL-003**	**EL-004**	**EL-004**	**EL-004**	**EL-005**	**EL-005**	**EL-006**	**EL-006**	
Date Collected		**25-Oct**	**25-Oct**	**27-Oct**	**25-Oct**	**25-Oct**	**25-Oct**	**25-Oct**	**27-Oct**	**25-Oct**	**25-Oct**	**27-Oct**	**25-Oct**	**25-Oct**	**25-Oct**	**25-Oct**	
Volume (Liters)		**120**	**120**	**120**	**76.8**	**120**	**120**	**120**	**120**	**120**	**93.5**	**120**	**120**	**120**	**120**	**120**	
		Concentration in milligram/cubic meter (mg/m^3)															
Compound	**Range**																**MDL**
Sulfuric Acid	ND-0.056		0.046					0.043			0.055			0.056		0.056	0.043

MDL: Method Detection Limit

Sampling Locations:

EL-001 Elementary School at SW Corner
EL-002 Elementary School at Entrance
EL-003 Backyard of E House on Etruria Street
EL-004 Side yard of C House on Etruria Street near garage
EL-005 Elementary School Playground
EL-006 Bank of Ohio River across from 1911 Ohio Avenue

TABLE 10
SUMMARY TABLE FOR VOCs DETECTED IN AIR - ROUND #2
Dates Sampled November 1-2, 2000

Sample Number		24790	24814	24832	24791	24815	24833	24792	24816	24834	24793	24817	24835	24794	24818	24836	24795	24819	24837	
Sampling Location		**E-L001**	**E-L001**	**E-L001**	**EL-002**	**EL-002**	**EL-002**	**EL-003**	**EL-003**	**EL-003**	**EL-004**	**EL-004**	**EL-004**	**EL-005**	**EL-005**	**EL-005**	**EL-006**	**EL-006**	**EL-006**	
Date Collected		**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	
Volume (Liters)		**480**	**480**	**480**	**480**	**480**	**480**	**345**	**480**	**477**	**480**	**244**	**480**	**330**	**480**	**480**	**480**	**480**	**480**	
		Concentration in parts per billion by volume (ppbv)																		
Compound	**Range**																			**MDL***
Benzene	0.8J-1.7	0.9J	0.9J	1.4	1.0J	1J	1.1J	1J	1.1J	1.2J	1.7	1.3J	1.2J	1.2J	1J	1.4	0.8J	0.8J	1.3	1.3
n-Heptane	ND-0.32J					0.23J					0.32J			0.3J	0.25J		0.24J			0.9
Toluene	1.6-6.4	1.6	2.2	2.4	2.7	2.6	1.8	1.9	2.6	2.2	4.6	3.3	2.0	3.2	6.4	6.2	2.0	1.7	2.3	1.1
Ethylbenzene	ND-0.52J			0.22J		0.25J				0.19J	0.52J					0.25J	0.24J		0.2J	0.9
para-Xylene	0.51J-1.9	0.8J	0.94	0.74J	1.1	0.89J	0.51J	0.8J	1.0	0.6J	1.9	1.1	0.6J	1.4	1.1	0.83J	0.9J	0.82J	0.67J	0.9
ortho-Xylene	ND-0.73J		0.32J	0.27J	0.4J				0.36J	0.2J	0.73J		0.2J	0.51J	0.5J	0.35J	0.4J	0.3J	0.26J	1.0
Cumene	ND-0.2J															0.2J				0.8
Mesitylene	ND-1.0										0.29J				1.0	1.0				0.8
D-Limonene	ND-0.7				0.14J				0.15J			0.32J			0.61J	0.7				0.7
Trimethyl benzene isomer	ND-4.3															4.3				NA[1]

MDL: Method Detection Limit
J: The value is below the method detection limit and is estimated
*: MDL based on 480 liters of sample volume
NA[1]: MDL not avaliable; results are estimated

Sampling Locations:

EL-001	Elementary School at SW Corner
EL-002	Elementary School at Entrance
EL-003	Backyard of E House on Etruria Street
EL-004	Side yard of C House on Etruria Street near garage
EL-005	Elementary School Playground
EL-006	Bank of Ohio River across from 1911 Ohio Avenue

TABLE 11

SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #2

Dates Sampled November 1-2, 2000

Sample Number		**24806**	**24826**	**24844**	**24807**	**24827**	**24845**	**24808**	**24828**	**24846**	**24809**	**24829**	**24847**	**24810**	**24830**	**24811**	**24831**	**24849**	
Sampling Location		**EL-001**	**EL-001**	**EL-001**	**EL-002**	**EL-002**	**EL-002**	**EL-003**	**EL-003**	**EL-003**	**EL-004**	**EL-004**	**EL-004**	**EL-005**	**EL-005**	**EL-006**	**EL-006**	**EL-006**	
Date Sampled		**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**1-Nov**	**2-Nov**	**2-Nov**	
Volume (Liters)		**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	
		Concentration in microgram/cubic meter (µg/m^3)																	
Metal	**Range**																		**MDL***
Calcium	ND-26	10	6.5	9.1	6.1		6.7	5.6		7.1	18	5.6	26	8.4		5.4	7.6	7.4	5.2
Iron	ND-5.9	1.8	2.3	4.6	1.8	1.6	4.4	1.5	1.9	4.1	2.3	2.1	5.8	2.1	1.7	2.6	5.9	5	1.3
Lead	ND-0.34		0.12	0.29			0.34	0.28		0.17		0.15	0.19				0.12	0.19	0.10
Manganese	ND-7.3		1.3	2.2		1	2.4		1.4	1.9	0.37	2	2		0.49	0.41	7.3	2	0.26
Zinc	ND-1.6	0.77	0.55	1.6	0.54		1.6			1.5	0.63	0.6	1.4		0.58	0.58	0.6	1.5	0.52

MDL: Method Detection Limit

*: MDL based on 480 liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Locations:

EL-001 Elementary School at SW Corner

EL-002 Elementary School at Entrance

EL-003 Backyard of E House on Etruria Street

EL-004 Side yard of C House on Etruria Street near garage

EL-005 Elementary School Playground

EL-006 Bank of Ohio River across from 1911 Ohio Avenue

TABLE 12

SUMMARY TABLE FOR INORGANIC ACIDS DETECTED IN AIR - ROUND #2

Dates Sampled November 1-2, 2000

Sample Number		24798	24820	24838	24799	24821	24839	24800	24822	24840	
Sampling Location		EL-001	EL-001	EL-001	EL-002	EL-002	EL-002	EL-003	EL-003	EL-003	
Date Collected		1-Nov	2-Nov	2-Nov	1-Nov	2-Nov	2-Nov	1-Nov	2-Nov	2-Nov	
Volume (Liters)		120	120	120	120	120	120	120	91.82	93.5	
		Concentration in milligram/cubic meter (mg/m^3)									
Compound	**Range**										**MDL***
Sulfuric Acid	ND-0.054			0.054			0.046				0.043

Sample Number	24801	24823	24841	24802	24824	24842	24803	24825	24843	
Sampling Location	EL-004	EL-004	EL-004	EL-005	EL-005	EL-005	EL-006	EL-006	EL-006	
Date Collected	1-Nov	2-Nov	2-Nov	1-Nov	2-Nov	2-Nov	1-Nov	2-Nov	2-Nov	
Volume (liters)	120	120	120	120	120	99.75	78	78	120	
	Concentration in milligram/cubic meter (mg/m^3)									
Compound										**MDL***
Sulfuric Acid			0.043						0.053	0.043

*: MDL based on 120 liters of sample volume

MDL: Method Detection Limit

Sampling Locations:

EL-001 Elementary School at SW Corner

EL-002 Elementary School at Entrance

EL-003 Backyard of E House on Etruria Street

EL-004 Side yard of C House on Etruria Street near garage

EL-005 Elementary School Playground

EL-006 Bank of Ohio River across from 1911 Ohio Avenue

TABLE 13
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #3
Dates Sampled November 7-12, 2000

Sample Number		EL-001	EL-001A	EL-001B	EL-001C	EL-002	EL-002A	EL-002B	EL-002C	EL-003	EL-003A	EL-003B	EL-003C	
Date Sampled		7-Nov	8-Nov	11-Nov	12-Nov	7-Nov	8-Nov	11-Nov	12-Nov	7-Nov	8-Nov	11-Nov	12-Nov	
Volume (Liters)		18556.5	17133.1	17500	22129.5	18559.5	20134.5	18212	21587	18096	20323.5	19035	21593	
		Concentration in microgram/cubic meter (µg/m^3)												
Metal	**Range**													**MDL***
Aluminum	ND-0.8	0.57	0.39			0.44	0.51			0.44	0.57			0.067
Antimony	ND-0.005		0.003				0.004				0.004			0.003
Arsenic	ND-0.0087	0.003	0.006			0.004	0.006			0.004	0.007			0.003
Barium	ND-0.061	0.025	0.031			0.024	0.036			0.022	0.04			0.007
Calcium	ND-19	4.9	1.9	0.15	0.27	4.8	2.6	0.25	0.22	4.3	2.8	0.32	0.3	0.13
Chromium	ND-0.16	0.042	0.044			0.045	0.084	0.007		0.064	0.11			0.007
Cobalt	ND-0.027													0.013
Copper	ND-0.07	0.024	0.02			0.028	0.029			0.028	0.03			0.013
Iron	ND-9.6	2	2	0.076	0.11	2.3	2.6	0.072	0.079	2.4	3.1	0.11	0.13	0.034
Lead	ND-0.061	0.039	0.034	0.005	0.008	0.041	0.039	0.003	0.006	0.042	0.045	0.005	0.008	0.003
Manganese	ND-22	1.8	1.3		0.008	3	2			3.4	2.4	0.007	0.01	0.007
Nickel	ND-.054					0.02	0.015			0.018	0.018			0.013
Selenium	ND-0.04	0.011	0.029			0.009	0.037			0.009	0.04			0.003
Vanadium	ND-0.02													0.013
Zinc	ND-0.56	0.3	0.22		0.062	0.33	0.3		0.039	0.34	0.31	0.02	0.078	0.013

Sample Number	EL-004	EL-004A	EL-004B	EL-004C	EL-005	EL-005A	EL-005B	EL-005C	EL-006	EL-006A	EL-006B	EL-006C	
Date Sampled	7-Nov	8-Nov	11-Nov	12-Nov	7-Nov	8-Nov	11-Nov	12-Nov	7-Nov	8-Nov	11-Nov	12-Nov	
Volume (Liters)	10549.5	17670	4800	13950	18855	19534.5	19080	20934	16226	19170	18600	17340	
					Concentration in microgram/cubic meter (µg/m^3)								
Metal													**MDL***
Aluminum	0.8	0.59			0.37	0.45			0.74	0.62			0.067
Antimony		0.004				0.003				0.005			0.003
Arsenic		0.007				0.006			0.012	0.009			0.003
Barium	0.042	0.04			0.02	0.038			0.053	0.061			0.007
Calcium	19	3.1		0.91	4.5	2.8	0.24	0.31	8.6	4	0.23	0.26	0.13
Chromium	0.094	0.1	0.03		0.021	0.048			0.16	0.13	0.007		0.007
Cobalt									0.027				0.013
Copper	0.037	0.036			0.023	0.023			0.07	0.036			0.013
Iron	3.1	3.1	1.5	0.16	1.5	2.3	0.092	0.12	9.6	6.3	0.11	0.14	0.034
Lead	0.051	0.043		0.006	0.033	0.041	0.004	0.009	0.061	0.048	0.003	0.009	0.003
Manganese	4.1	2.4		0.015	1.4	1.5		0.009	22	7.6	0.01	0.012	0.007
Nickel	0.026	0.015							0.054	0.02			0.013
Selenium	0.012	0.04			0.006	0.035			0.011	0.039			0.003
Vanadium										0.02			0.013
Zinc	0.24	0.32			0.26	0.25	0.014	0.059	0.56	0.36	0.015	0.031	0.013

MDL: Method Detection Limit

*: MDL based on 22129.5 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Locations:

EL-001	Roof of Administration Building
EL-002	Elementary School at Entrance
EL-003	Backyard of E House on Etruria Street
EL-004	Side yard of C House on Etruria Street near garage
EL-005	Elementary School Playground
El-006	Bank of Ohio River across from 1911 Ohio Avenue

TABLE 14
SUMMARY TABLE FOR DIOXINS DETECTED IN AIR - ROUND #4
Dates Sampled November 13-17, 2000

Sample No. 0180-		**-126**		**-141**		**-153**		**-160**		**-124**		**-137**		**-149**		**-157**	
Sampling Location		**WTI-1**		**WTI-1**		**WTI-1**		**WTI-1**		**WTI-2**		**WTI-2**		**WTI-2**		**WTI-2**	
Date collected		**14-Nov**		**15-Nov**		**16-Nov**		**17-Nov**		**14-Nov**		**15-Nov**		**16-Nov**		**17-Nov**	
Volume (cubic meter)		**369.51**		**391.85**		**361.83**		**350.39**		**408.9**		**390.83**		**383.09**		**383.78**	
		Concentration in picogram/cubic meter (pg/m^3)															
Compound	MDL pg	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC
2,3,7,8-TCDD	10		0.0103				0.0152		0.0123		0.0098			0.2516			
1,2,3,7,8-PeCDD	50	0.0078 J		0.0071 J		0.0478 J		0.0128 J		0.0068 J		0.0072 J		1.3835		0.0047 J	
1,2,3,4,7,8-HxCDD	50	0.0081 J		0.0071 J		0.0553 J		0.0126 J		0.0064 J				1.2086			
1,2,3,6,7,8-HxCDD	50	0.0138 J			0.0138	0.0934 J		0.0200 J		0.0115 J			0.0154	2.4302			0.0115
1,2,3,7,8,9-HxCDD	50		0.0097	0.0130 J		0.1000 J		0.0337 J		0.0090 J		0.0200 J		2.5921		0.0076 J	
1,2,3,4,6,7,8-HpCDD	50	0.1727		0.2455		1.3404		0.4623 J		0.1462		0.2917		43.0708		0.1407 J	
OCDD	100	0.5927		1.5210		4.5602		3.3391		0.5307		2.4307		172.0222		0.4847 J	
2,3,7,8-TCDF	10	0.0106 J		0.0051 J			0.0072		0.0068		0.0073			0.0433			0.0081
1,2,3,7,8-PeCDF	50	0.0143 J				0.0099 J		0.0074 J			0.0083	0.0041 J		0.1049 J		0.0055 J	
2,3,4,7,8-PeCDF	50	0.0227 J		0.0075 J		0.0149 J			0.0120	0.0132 J		0.0054 J		0.1906		0.0091 J	
1,2,3,4,7,8-HxCDF	50	0.0217 J			0.0061	0.0177 J			0.0131	0.0108 J		0.0069 J		0.2897		0.0096 J	
1,2,3,6,7,8-HxCDF	50	0.0219 J			0.0069	0.0171 J			0.0126	0.0112 J			0.0059	0.1872		0.0083 J	
2,3,4,6,7,8-HxCDF	50	0.0225 J				0.0191 J			0.0140	0.0120 J		0.0056 J		0.2415			0.0099
1,2,3,7,8,9-HxCDF	50							0.0051 J						0.1013 J		0.0052	
1,2,3,4,6,7,8-HpCDF	50	0.0606 J		0.0163 J		0.0316 J		0.0414 J		0.0396 J		0.0317 J		1.0206		0.0328 J	
1,2,3,4,7,8,9-HpCDF	50	0.0084 J				0.0111 J			0.0083					0.3002			
OCDF	100	0.0349 J		0.0151 J		0.0721 J		0.0362 J		0.0330 J		0.0281 J		1.4200			0.0276
Total TCDDs		0.0119	0.0203			0.0995	0.2073		0.0382	0.0159				4.3593	4.4376		
Total PeCDDs		0.0644	0.0752	0.0510	0.0587	0.7904	0.8844	0.0457	0.1199	0.0342	0.0531	0.0328	0.0399	14.5919		0.0287	0.0328
Total HxCDDs		0.1083	0.1383	0.1051	0.1189	1.6361	1.7494	0.3168		0.0514	0.0831	0.0450	0.1039	28.4528	28.4528	0.0076	0.0719
Total HpCDDs		0.3735		0.5538		4.1732		1.0560		0.3253		0.7215		93.4506		0.3023	
Total TCDFs		0.3139	0.3518	0.0944		0.1719	0.2421	0.1578	0.2106	0.1477	0.1739	0.0435	0.0425	2.6077	2.6365	0.1071	0.1345
Total PeCDFs		0.2300		0.0664		0.1299	0.199	0.1073	0.1418	0.0978	0.1215	0.0384	0.0527	2.3545	2.3989	0.0688	0.1006
Total HxCDFs		0.1686		0.0110	0.0240	0.1346	0.1785	0.0713	0.1113	0.0763	0.0866	0.0366	0.0466	2.5190	2.6365	0.0584	0.0683
Total HpCDFs		0.1034		0.0163	0.0248	0.2006		0.0542	0.0771	0.0396	0.0660	0.0458		3.2368	3.4457	0.0542	
TEQ (ND=0)		0.0290		0.0140		0.0813		0.2226		0.0179		0.0141		2.3702		0.0128	
TEQ (ND=1/2)		0.0344		0.0186		0.0843		0.0237		0.0237		0.0184		2.3702		0.0164	
TEQ EMPC (ND=0)		0.0298		0.0156		0.0970		0.0454		0.0191		0.0156		2.3702		0.0149	
TEQ EMPC (ND=1/2)		0.0403		0.0197		0.0973		0.0454		0.0293		0.0194		2.3702		0.0180	

J: The value is below the method detection limit and is estimated
EMPC: Estimated maximum possible concentration
TEQ: Toxicity Equivalents
MDL: Method Detection Limit

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant
WTI-3 West Virginia DEP site, Lawrenceville, WV
WTI-4: Roof of East Liverpool City Hall
WTI-5: End of Walter Street

TABLE 14 (continued)
SUMMARY TABLE FOR DIOXINS DETECTED IN AIR - ROUND #4
Dates Sampled November 13-17, 2000

Sample No. 0180-		**-128**		**-138**		**-150**		**-158**		**-142**	
Sampling Location		**WTI-3**		**WTI-3**		**WTI-3**		**WTI-3**		**WTI-5**	
Date collected		**14-Nov**		**15-Nov**		**16-Nov**		**17-Nov**		**15-Nov**	
Volume (cubic meter)		**373.26**		**417.45**		**427.49**		**424.03**		**246.3**	
		Concentration in picogram/cubic meter (pg/m^3)									
Compound	MDL pg	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC
2,3,7,8-TCDD	10						0.0101		0.0090	0.1218	
1,2,3,7,8-PeCDD	50					0.0218 J		0.0050 J		0.9135	
1,2,3,4,7,8-HxCDD	50					0.0227 J			0.0059	0.5562	
1,2,3,6,7,8-HxCDD	50		0.0075			0.0377 J			0.0113	5.6029	
1,2,3,7,8,9-HxCDD	50		0.0080			0.0435 J		0.0092 J		3.4064	
1,2,3,4,6,7,8-HpCDD	50	0.1294 J		0.0589 J		0.6129		0.1257		39.4641	
OCDD	100	0.3724		0.1945		1.5322		0.4103		37.8806	
2,3,7,8-TCDF	10					0.0096 J			0.0028	0.1673	
1,2,3,7,8-PeCDF	50	0.0032 J				0.0073 J			0.0040	0.1616 J	
2,3,4,7,8-PeCDF	50	0.0046 J		0.0048 J		0.0147 J			0.0050	0.2818	
1,2,3,4,7,8-HxCDF	50	0.0080 J			0.0043	0.0133 J			0.0066	0.1518 J	
1,2,3,6,7,8-HxCDF	50		0.0070	0.0046 J			0.0131		0.0061	0.1957 J	
2,3,4,6,7,8-HxCDF	50	0.0070 J				0.0112 J		0.0061 J		0.1969 J	
1,2,3,7,8,9-HxCDF	50								0.0026		
1,2,3,4,6,7,8-HpCDF	50	0.0265 J		0.0127 J		0.0423 J		0.0222 J		0.7389	
1,2,3,4,7,8,9-HpCDF	50					0.0087 J		0.0045 J		0.1657 J	
OCDF	100	0.0217 J		0.0101 J		0.0372 J		0.0212 J		0.8973	
Total TCDDs					0.0053	0.0538	0.0936		0.0163	3.4145	3.5242
Total PeCDDs			0.0174	0.0086		0.2901	0.4211	0.0050	0.0278	7.6330	9.6224
Total HxCDDs			0.0750	0.0261		0.7930	0.8702	0.0590	0.0906	39.9513	
Total HpCDDs		0.2786		0.1337		2.0094	2.0094	0.2806		65.3674	
Total TCDFs		0.0589				0.2302	0.2643	0.0604	0.0941	8.4044	8.4856
Total PeCDFs		0.0321	0.0571	0.0287	0.0249	0.1474		0.0436		3.3942	3.5363
Total HxCDFs		0.0356	0.0488	0.0184	0.0228	0.1029	0.1170	0.0250	0.0547	1.7783	
Total HpCDFs		0.0429		0.0127		0.0917	0.0959	0.0420		2.2940	
TEQ (ND=0)		0.0056		0.0038		0.0395		0.0061		2.1965	
TEQ (ND=1/2)		0.0110		0.0079		0.0428		0.0078		2.2006	
TEQ EMPC (ND=0)		0.0080		0.0043		0.0519		0.0212		2.1965	
TEQ EMPC (ND=1/2)		0.0134		0.0081		0.0522		0.0212		2.2006	

J: The value is below the method detection limit and is estimated
EMPC: Estimated maximum possible concentration
TEQ: Toxicity Equivalents
MDL: Method Detection Limit

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant
WTI-3 West Virginia DEP site, Lawrenceville, WV
WTI-4: Roof of East Liverpool City Hall
WTI-5: End of Walter Street

Table 15
SUMMARY TABLE FOR PAHs DETECTED IN AIR - ROUND #4
Dates Sampled November 13-17, 2000

Sample #0180-	**-127**	**-140**	**-152**	**-161**	**-125**	**-136**	**-148**	**-156**	**-129**	**-139**	**-151**	**-159**	**-143**	
Sampling Location	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-5**	
Date Collected	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**15-Nov**	
Volume (cubic meter)	**368.21**	**385.54**	**359.38**	**347.47**	**387.15**	**375.89**	**386.52**	**371.36**	**321**	**377.17**	**357.47**	**373.19**	**219**	
	Concentration in parts per trillion by volume (pptv)													
Compound														**MDL***
Naphthalene	14	14	43	17	11	8.1	15	14	7.1	7.6	22	17	29	0.50
2-Methylnaphthalene	3.6	3.0	12	4.1	4.1	1.8	7.1	4.1	1.7	1.7	3.9	2.8	6.5	0.45
Acenaphthylene			1.3										1.9	0.42
Acenaphthene		0.45	1.1		0.70		0.58	0.51			0.71	0.72	0.80	0.42
Fluorene	0.48	0.46	1.2	0.47	0.53		0.57	0.40			0.58	0.63	1.08	0.39
Phenanthrene	1.0	1.0	3.3	0.91	0.96	0.62	1.2	0.81		0.40	1.2	1.2	3.1	0.36
Anthracene			0.69											0.36
Fluoranthene			1.1				0.31				0.37		1.0	0.32
Pyrene			0.98										1.5	0.32
Chrysene			0.36											0.28
Benzo(a)anthracene			0.39											0.28
Benzo(b)fluoranthene			0.32											0.26

MDL: Method Detection Limit
*: MDL based on 380 cubic meters of sample volume

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant
WTI-3 West Virginia DEP site, Lawrenceville, WV
WTI-4: Roof of East Liverpool City Hall
WTI-5: End of Walter Street

TABLE 16

SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #4

Dates Sampled November 13-17, 2000

Sample Number		**0180-402**	**24873**	**24878**	**0180-400**	**24850**	**24870**	**24875**	**0180-403**	**24851**	**24871**	**24876**	**0180-401**	**24852**	**24872**	**24877**	
Sampling Location		**WTI-1**	**WTI-1**	**WTI-1**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	
Date Sampled		**14-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	
Volume (Liters)		**14559.2**	**11973.1**	**16632**	**15626.6**	**12962.7**	**15309**	**14962.5**	**13158**	**14507**	**17483.75**	**15785**	**13729.5**	**8388**	**7479**	**7410**	
		Concentration in microgram/cubic meter (µg/m^3)															
Metal	**Range**																**MDL***
Aluminum	ND-1.1	0.21	0.46	0.34	0.13		1.1				0.23	0.083	0.12	0.23	0.27		0.071
Antimony	ND-0.0081									0.0081							0.0029
Arsenic	ND-0.014						0.0096							0.011	0.014		0.0029
Barium	ND-0.11	0.0094	0.023	0.011			0.11				0.0083						0.0071
Calcium	0.23-19	0.94	3.9	1.5	2.3	0.28	19	0.46	0.23	0.35	1.1	0.54	0.66	2.1	2.5	1.4	0.14
Chromium	ND-5.8		0.063		0.15		5.8				0.021		0.065	0.033	0.12	0.096	0.0071
Cobalt	ND-0.047						0.047										0.014
Copper	ND-0.19	0.027	0.029	0.021	0.064	0.19	0.16	0.16	0.021	0.18	0.039						0.014
Iron	0.12-20	0.3	1.4	0.77	0.91	0.13	20	0.18	0.12	0.12	0.62	0.13	0.59	1.2	1.6	0.84	0.036
Lead	0.0038-0.018	0.018		0.012	0.0067	0.0059		0.0083	0.008	0.0038		0.0086	0.01	0.016		0.014	0.0029
Manganese	ND-9.5	0.018	0.38	0.051	0.16	0.03	9.5	0.047			0.12	0.015	0.4	1.7	1.6	0.53	0.0071
Magnesium	ND- 2.1						2.1										0.71
Nickel	ND-0.65				0.029		0.65										0.014
Selenium	ND-0.011	0.0039	0.01		0.0037		0.0073	0.0062	0.0068		0.0094	0.0092	0.0056		0.011	0.0071	0.0029
Vanadium	ND-0.04						0.04										0.014
Zinc	0.02-0.16	0.065	0.088	0.038	0.027	0.024	0.16	0.02	0.027	0.021	0.066	0.029	0.035	0.12	0.075	0.037	0.014

MDL: Method Detection Limit

*: MDL based on 17483.75 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Locations:

WTI-1: Roof of Administration Building

WTI-2: Water Treatment Plant

WTI-3: West Virginia DEP site, Lawrenceville, WV

WTI-4: Roof of East Liverpool City Hall - Sampling apparatus interfered with police communication equipment, no sampling conducted at this location

WTI-5: End of Walter Street

TABLE 16 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR (PM MASS RESULTS) - ROUND #4
Dates Sampled November 13-17, 2000

Sample Number		**110265W**	**110268Z**	**110124K**	**110528O**	**1105768**	**1105724**	**1102941**	**1102952**	**110270T**	**110271U**	**110126M**	**110530U**	**1105746**	**1105713**	**1102963**	**1104710**
Sampling Location		**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**
Date Sampled		**13-14 Nov**	**13-14 Nov**	**14-15 Nov**	**14-15 Nov**	**15-16 Nov**	**15-16 Nov**	**16-17 Nov**	**16-17 Nov**	**13-14 Nov**	**13-14 Nov**	**14-15 Nov**	**14-15 Nov**	**15-16 Nov**	**15-16 Nov**	**16-17 Nov**	**16-17 Nov**
Volume (cubic meter)		**22.03**	**22**	**22.03**	**22.01**	**22.02**	**22**	**22.03**	**22.01**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**22**
PM Mass Type		**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**
		Concentration in microgram/cubic meter (µg/m^3)															
Metal	**Range**																
Aluminum	ND-1.4	0.064		0.19		0.34		0.34		0.15		0.019		1.4		0.074	
Antimony	ND-0.0054							0.00041		0.0016		0.00041		0.0046			
Arsenic	ND-0.012	0.00082				0.0031		0.0016		0.0028		0.00056		0.0017		0.0011	
Barium	ND-0.11	0.0084		0.0033		0.013		0.042		0.032		0.011		0.110		0.018	
Calcium	0.10-7.3	0.26		0.32		1.3		0.63		1.2		0.18		7.3		0.32	
Chromium	ND-18	0.23		0.0017		0.25		0.0041		2.2		0.0065		18		0.025	
Copper	ND-0.0.24	0.0051		0.0031		0.0054		0.0033		0.024		0.023		0.018		0.024	
Iron	ND-16	0.32		0.13		0.88		0.36		1.6		0.096		16		0.17	
Lead	ND-0.062	0.015		0.0051		0.015		0.0028		0.0061		0.0034		0.019		0.0060	
Manganese	ND-3.4	0.03		0.0066		0.21		0.023		0.14		0.016		3.4		0.025	
Magnesium	ND- 0.35					0.0035		0.0046		0.050				0.35			
Nickel	ND-0.38	0.0042				0.0064		0.00062		0.030		0.00015		0.38		0.00056	
Selenium	ND-0.0099	0.0066				0.0031		0.0054		0.0099		0.0013		0.0025		0.0048	
Vanadium	ND-0.0023					0.00051											
Zinc	ND-0.060	0.046		0.010		0.049		0.013		0.023		0.010		0.060		0.0098	
PM2.5 Mass conc.	7-23		19		11		19		15		17		9		23		13
PM10 Mass conc.	10-147	25		16		34		25		32		11		147		18	
Chromium VI (ng/m^3)	ND-1.58	0.64												1.58			

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant

TABLE 16 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR (PM MASS RESULTS) - ROUND #4
Dates Sampled November 13-17, 2000

Sample Number	1102690	110129P	108356P	110527Z	1105779	1104743	110266X	110267Y	110125L	110531V	1105757	1105702	1104732	110470Z	1105735	1105735	1105735	1105735
Sampling Location	WTI-3	WTI-3	WTI-3	WTI-3	WTI-3	WTI-3	WTI-4	WTI-4	WTI-4	WTI-4	WTI-4	WTI-4	WTI-4	WTI-4	WTI-5	WTI-5	WTI-5	WTI-5
Date Sampled	13-14 Nov	13-14 Nov	14-15 Nov	14-15 Nov	15-16 Nov	16-17 Nov	13-14 Nov	13-14 Nov	14-15 Nov	14-15 Nov	15-16 Nov	15-16 Nov	16-17 Nov	16-17 Nov	13-14 Nov	14-15 Nov	15-16 Nov	16-17 Nov
Volume (cubic meter)	22	21.997	21.5	21.563	22	21.7	22.01	22.03	22.01	22.03	22.02	22.03	22.03	22.03	21.997	21.997	21.997	21.998
PM Mass Type	PM10	PM2.5	PM10	PM2.5	PM10	PM10	PM10	PM2.5	PM10	PM2.5	PM10	PM2.5	PM10	PM2.5	PM10	PM10	PM10	PM10
							Concentration in microgram/cubic meter (µg/m^3)											
Metal																		
Aluminum	0.039		0.0038		0.073	0.062	0.030		0.0046		0.17		0.091				0.20	0.22
Antimony			0.0051						0.00062		0.0023						0.0054	0.0012
Arsenic	0.000050				0.0020	0.0013	0.00031				0.0031		0.0021				0.012	0.0042
Barium	0.011		0.031		0.025	0.021	0.015		0.020		0.027		0.023				0.035	0.018
Calcium	0.10		0.13		0.40	0.29	0.54		0.15		1.2		0.66				1.5	1.3
Chromium	0.0010		0.00011		0.052	0.002	0.0021		0.00025		0.17		0.0023				0.74	0.69
Cobalt																		
Copper	0.0043		0.0034		0.014	0.0021	0.0024		0.0017		0.0037		0.0029				0.0036	0.0021
Iron	0.11		0.064		0.37	0.12	0.1677		0.077		0.60		0.14				1.4	1.3
Lead	0.0072		0.0040		0.0081	0.0041	0.0130		0.0045		0.062		0.023				0.0084	0.0042
Manganese	0.0041		0.0045		0.049	0.011	0.0067		0.0035		0.11		0.011				0.45	1.2
Magnesium							0.0011		0.0076		0.010							0.0057
Nickel	0.0016		0.00063		0.0024	0.00026	0.0010		0.00025		0.0047		0.00072				0.015	0.0096
Selenium	0.0066		0.00089		0.0049	0.0064	0.0078		0.0011		0.0032		0.0052				0.0034	0.0045
Vanadium					0.0023						0.00082							
Zinc	0.016		0.0083		0.033	0.010	0.019		0.0080		0.048		0.023				0.041	0.017
PM2.5 Mass conc.		12		7				13		8.0		15		12				
PM10 Mass conc.	16		10		18	16	19		11		26		19				35	29
Chromium VI (ng/m^3)															0.75		0.63	

Sampling Locations:
WTI-3: West Virginia DEP site, Lawrenceville, WV
WTI-4: Roof of East Liverpool City Hall
WTI-5: End of Walter Street

TABLE 17
SUMMARY TABLE OF VOCs DETECTED IN AIR - ROUND #4
November 13-17, 2000

Sample Number		0180-502	24854	24859	24884	0180-500	24855	24880	24886
Sampling Location		WTI-1	WTI-1	WTI-1grab	WTI-1grab	WTI-2	WTI-2	WTI-2	WTI-2
Date Collected		11/14/00	11/15/00	11/15/00	11/16/00	11/14/00	11/15/00	11/16/00	11/17/00
		Concentration in parts per billion by volume (ppbv)							
Compound	**MDL**								
Chloromethane	0.73				0.78				
Freon 12	0.73								
Freon 11	0.73								
Methylene Chloride	0.73	37	9.2 B			1.8	6.6 B	3.6	
Toluene	0.73					0.86		2.4	
Chlorobenzene	0.73					1			
Acetone	2.9					3.7			
Hexane	2.9								
Trichloroethene	0.73								
Ethanol	2.9								
m,p-xylene	0.73			1					
Total TICs:		26		22.5	4.9	17.4		22	

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant
WTI-3: West Virginia DEP site, Lawrenceville, WV
WTI-5: End of Walter Street

Sample Number	0180-503	24856	24881	24887	0180-501	24882	24888	24857	24858	24883
Sample Location	WTI-3	WTI-3	WTI-3	WTI-3	WTI-5	WTI-5	WTI-5	City Hall	City Hall grab	City Hall grab
Date Collected	11/14/00	11/15/00	11/16/00	11/17/00	11/14/00	11/16/00	11/17/00	11/15/00	11/15/00	11/16/00
	Concentration in parts per billion by volume (ppbv)									
Compound										
Chloromethane										
Freon 12							0.78			
Freon 11					2.4					
Methylene Chloride	67	20 B	1.8		2.8	1200		59 B		2.2
Toluene					3.2					8
Chlorobenzene										
Acetone										
Hexane	65		3.7			46				120
Trichloroethene				0.88						
Ethanol										3.4
m,p-xylene										
Total TICs:	21				41		8.4			10

B: The analyte was found in the blank
TICs: Tentatively Identified Compounds

TABLE 18
SUMMARY TABLE FOR TOTAL DIOXIN TEQs IN AIR - ROUND #4
Dates Sampled November 14-17, 2000

Sample No. 0180-	**-126**	**-141**	**-153**	**-160**	**-124**	**-137**	**-149**	**-157**	**-128**	**-138**	**-150**	**-158**	**-142**
Sampling Location	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-3**	**WTI-5**
Date Collected	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**17-Nov**	**15-Nov**
Volume (cubic meter)	**369.51**	**391.85**	**361.83**	**350.39**	**408.9**	**390.83**	**383.09**	**383.78**	**373.26**	**417.45**	**427.49**	**424.03**	**246.3**
	Concentration in picogram/cubic meter (pg/m^3)												
TEQ EMPC (ND=1/2MDL)*	0.041	0.020	0.097	0.045	0.029	0.019	2.370	0.018	0.013	0.008	0.052	0.021	2.201

* : Toxicity Equivalent Factor using estimated maximum possible concentration and assuming concentrations for non-detects of half the Method Detection Limit

Sampling Locations:
WTI-1: Roof of Administration Building
WTI-2: Water Treatment Plant
WTI-3: West Virginia DEP site, Lawrenceville, WV
WTI-5: End of Walter Street

TABLE 19
Literature Values, Average Total Toxicity Equivalents for Dioxins*

Location	TEQ, pg/m^3	Comments
Germany	0.12	
Japan, average for background areas (villages)	0.07	Japan: Annual averages, sampled twice in summer and twice winter (1996-1997)
Japan, average for medium-sized cities	1.36	
Japan, average for large cities	1.02	
Netherlands	0.08	
Sweden	0.024	
United Kingdom	0.4	
United States	0.09	

* Tamaki, B. posting to dioxin listerv,dioxin-1@essential.org., May 14-16, 1998.

TABLE 20
Chemical Composition of $PM_{2.5}$ Samples
Dates Sampled November 13-16, 2000

Sampling Location	East Liverpool City Hall	Lawrenceville WV	East Liverpool Elementary School	Water Treatment Plant	Walter Street
			Percent by weight (%)		
Component					
Sulfate ion	26	30	22	23	22
Organic Carbon	27	23	32	23	35
Nitrate ion	17	17	19	15	16
Ammonium ion	13	14	14	11	12
Sum of all Elements	13	13	9	23	10
Elemental Carbon	3	2	4	4	4
Potassium/Sodium ions	0.18	0.21	0.29	0.24	0.29

TABLE 21

SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5

Dates Sampled December 5-10, 2000

Sample Number		**15752**	**15759**	**15776**	**15790**	**15805**	**15720**	**15694**	**15629**	**15653**	**15675**	**28479**	
Sampling Location		**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**7463**	**6032.5**	**7201**	**7248**	**7264**	**7200**	**7323**	**6940**	**7443**	**7050**	**7169**	
		Concentration in microgram/cubic meter (µg/m^3)											
Metal	**Range**												**MDL***
Aluminum	ND - 0.30				0.27						0.30	0.27	0.17
Arsenic	ND - 0.030				0.030								0.0067
Barium	ND - 0.024											0.024	0.017
Calcium	ND - 1.8			0.93	1.8	0.6	0.54	0.38			1.5	1.6	0.33
Chromium	ND - 0.033								0.033	0.022	0.027		0.017
Copper	ND - 0.037											0.037	0.033
Iron	ND - 4.6				1.3	0.68		4.6			4.1	0.30	0.084
Lead	ND - 0.029				0.016	0.0094	0.022	0.024	0.027	0.0075	0.017	0.029	0.0067
Manganese	ND - 0.10			0.024	0.060		0.066	0.07			0.10	0.038	0.017
Selenium	ND - 0.012	0.01				0.0069		0.01				0.012	0.0067
Sodium	ND - 2.2						2.1				2.2		1.7
Zinc	ND - 0.48				0.092		0.082	0.069	0.054	0.037	0.046	0.48	0.033

J: The value is below the method detection limit and is estimated

MDL: Method Detection Limit

*: MDL based on 7463 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-1 Roof of Administration Building

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15750**	**15758**	**15774**	**15788**	**15801**	**15802**	**15721**	**15722**	**15695**	**15684**	**15625**	**15626**	**15649**	**15650**	**15671**	**15672**	**28475**	**28476**	
Sampling Location		**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	**WTI-2**	**WTI-2A**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	**10-Dec**	
Volume (Liters)		**7187**	**6316**	**7178**	**7242**	**7303**	**720**	**7140**	**717**	**7344**	**720**	**6920**	**692**	**7420**	**720**	**7010**	**702**	**7511**	**720**	
		Concentration in microgram/cubic meter (µg/m^3)																		
Metal	**Range**																			**MDL***
Aluminum	ND - 4.3							0.34		0.45	4.3				2.3			0.24		0.17
Barium	ND - 0.023									0.023										0.017
Calcium	ND - 1.5		0.56	0.47		0.5				1.5						0.80		0.93		0.33
Chromium	ND - 0.44	0.031								0.02			0.20	0.033	0.35			0.035	0.44	0.017
Copper	ND - 0.54																	0.038	0.54	0.033
Iron	ND - 25	3.8		0.60	0.50	1.6				8.0	1.5					1.4		1.4	25	0.083
Lead	ND - 0.096	0.0086			0.017	0.0089				0.013	0.076	0.015		0.0083		0.0093		0.027	0.096	0.0067
Manganese	ND - 0.80	0.066	0.038	0.026	0.034	0.037		0.29	0.32	0.62				0.020		0.80	0.58	0.076	0.34	0.017
Selenium	ND - 0.009	0.009			0.0069	0.0079				0.0082										0.0067
Sodium	ND - 2.3															1.9		2.3		1.7
Vanadium	ND - 0.037									0.037										0.033
Zinc	ND - 0.70				0.07		0.54	0.038		0.077		0.039				0.042		0.45	0.7	0.033

MDL: Method Detection Limit

*: MDL based on 7511 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-2 Water Treatment Plant

WTI-2A PM10 Location at Water Treatment Plant

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15710**	**15724**	**15687**	**15630**	**15654**	**15677**	**15985**	
Sampling Location		**WTI-4**	**WTI-4**	**WTI-4**	**WTI-4**	**WTI-4**	**WTI-4**	**WTI-4**	
Date Sampled		**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**720**	**705**	**698**	**792**	**703**	**720**	
		Concentration in microgram/cubic meter (µg/m^3)							
Metal	**Range**								**MDL***
Aluminum	ND - 2.7			2.7					1.6
Chromium	ND - 0.45				0.45			0.23	0.16
Copper	ND - 0.38						0.38		0.32
Iron	ND - 5.5	4.9			5.5				0.79
Manganese	ND - 1.2	1.2							0.16
Silver	ND - 0.23							0.23	0.16
Sodium	ND - 25						25		16
Zinc	ND - 0.68	0.66		0.41			0.68	0.58	0.32

MDL: Method Detection Limit

*: MDL based on 792 liters of sample volume
Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:
WTI-4 Roof of East Liverpool City Hall

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15754**	**15760**	**15775**	**15789**	**15803**	**15804**	**15725**	**15726**	**15693**	**15688**	**15627**	**15628**	**15651**	**15652**	**15673**	**15674**	**28477**	**28478**	
Sampling Location		**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	**WTI-5**	**WTI-5D**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	**10-Dec**	
Volume (Liters)		**100**	**6340**	**1840**	**7250**	**5350**	**720**	**2210**	**717**	**7140**	**715**	**6820**	**690**	**3280**	**738**	**5396**	**700**	**6760**	**720**	
									Concentration in microgram/cubic meter (µg/m^3)											
Metal	**Range**																			**MDL***
Aluminum	ND - 2.0				0.40										2.0			0.25		0.17
Barium	ND - 0.028				0.028															0.017
Calcium	ND - 9.2		1.1	2.1	9.2	2.6				0.45		0.87				0.51		1.1		0.34
Chromium	ND - 0.47		0.28	0.23	0.10	0.039			0.24			0.18	0.47	0.063	0.23		0.29			0.017
Iron	ND - 43		7.6	1.2	4.3	3.3			43			2.0	2.4				24		14	0.086
Lead	ND - 0.33		0.16	0.029	0.091	0.013			0.078	0.0089		0.13	0.33	0.052		0.012	0.092	0.025	0.073	0.0069
Manganese	ND - 8.9		2.3	0.88	1.1	0.6	0.62	0.066	0.88	0.2		8.3	8.9	0.27		0.048	0.61	0.035	0.32	0.017
Nickel	ND - 0.071		0.071																	0.034
Selenium	ND - 0.011					0.0098				0.011								0.0092		0.0069
Zinc	ND - 0.71		0.15		0.16		0.71	0.11		0.054		0.10						0.39	0.50	0.034

MDL: Method Detection Limit
*: MDL based on 7250 liters of sample volume
Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:
WTI-5 End of Walter Street
WTI-5D Walter Street Duplicate

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15756**	**15761**	**15777**	**15791**	**15711**	**15727**	**15692**	**15631**	**15655**	**15676**	**15984**	
Sampling Location		**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**5379**	**6090**	**3520**	**5100**	**7200**	**3250**	**4920**	**6940**	**1574**	**6269**	**7200**	
					Concentration in microgram/cubic meter (µg/m^3)								
Metal	**Range**												**MDL***
Aluminum	ND - 0.53		0.34					0.53			0.30	0.28	0.17
Barium	ND - 0.017											0.017	0.017
Calcium	ND - 3.6		3.6	0.74	1.2			0.61	0.43		2.8	1.8	0.35
Chromium	ND - 0.084				0.084		0.06					0.035	0.017
Iron	ND - 8.6		0.39		8.6	0.74	2.1	1.9	0.17		1.1	0.59	0.087
Lead	ND - 0.041		0.012		0.040	0.013	0.024	0.021	0.038	0.041	0.014	0.035	0.0069
Manganese	ND - 0.12		0.077		0.12		0.072	0.057	0.036		0.10	0.052	0.017
Selenium	ND - 0.013	0.011						0.013				0.012	0.0069
Sodium	ND - 7.6						7.6				3.1		1.7
Zinc	ND - 0.56				0.10	0.051	0.15	0.073	0.083		0.078	0.56	0.035

MDL: Method Detection Limit

*: MDL based on 7200 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-6 Port Authority Parking Area

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15766**	**15784**	**15728**	**15685**	**15620**	**15644**	**15666**	**28470**	
Sampling Location		**WTI-7**	**WTI-7**	**WTI-7**	**WTI-7**	**WTI-7**	**WTI-7**	**WTI-7**	**WTI-7**	
Date Sampled		**6-Dec**	**6-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**720**	**720**	**720**	**690**	**720**	**700**	**720**	
		Concentration in microgram/cubic meter (µg/m^3)								
Metal	**Range**									**MDL***
Chromium	ND - 0.29			0.25		0.29	0.18			0.17
Copper	ND - 0.37							0.37		0.35
Iron	ND - 14		12	14		1.7	1.1	4.7		0.87
Manganese	ND - 0.33		0.23	0.33		0.29		0.18		0.17
Sodium	ND - 19							19		17
Zinc	ND - 0.56								0.56	0.35

MDL: Method Detection Limit

*: MDL based on 720 Liters of sample volume
Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:
WTI-7 West End of Ohio Avenue

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15767**	**15785**	**15797**	**15690**	**15621**	**15645**	**15667**	**28471**	
Sampling Location		**WTI-8**	**WTI-8**	**WTI-8**	**WTI-8**	**WTI-8**	**WTI-8**	**WTI-8**	**WTI-8**	
Date Sampled		**6-Dec**	**6-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**720**	**720**	**1080**	**693**	**720**	**700**	**720**	
		Concentration in microgram/cubic meter (µg/m^3)								
Metal	**Range**									**MDL***
Aluminum	ND - 2.1						2.1			1.2
Chromium	ND - 0.22				0.22					0.12
Iron	ND - 46	1.3	46	15	16	3.8	21			0.58
Lead	ND - 0.083				0.083					0.046
Manganese	ND - 3.6	0.18	3.6	0.48	0.74	0.20	0.32	1.0		0.12
Zinc	ND - 0.64		0.4	0.64	0.24				0.40	0.23

MDL: Method Detection Limit

*: MDL based on 1080 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-8 Route 39 E at Monument

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15768**	**15786**	**15798**	**15730**	**15686**	**15622**	**15646**	**15668**	**28472**	
Sampling Location		**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	**WTI-9**	
Date Sampled		**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**720**	**720**	**720**	**684**	**694**	**756**	**740**	**754**	
		Concentration in microgram/cubic meter (µg/m^3)									
Metal	**Range**										**MDL***
Calcium	ND - 5.6		5.6								3.3
Chromium	ND - 0.28			0.18			0.28		0.25		0.17
Iron	ND - 24	2.6	11	21	6.3		7.8		24		0.83
Lead	ND - 0.34		0.086	0.072				0.34			0.066
Manganese	ND - 3.9	0.29	3.9	1.8	3.5		0.25	0.33	0.44		0.17
Sodium	ND - 17								17		17
Zinc	ND - 0.67			0.67						0.35	0.33

MDL: Method Detection Limit

*: MDL based on 756 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-9 Route 39 E at Entrance

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15769**	**15787**	**15799**	**15731**	**15689**	**15623**	**15647**	**15669**	**28473**	
Sampling Location		**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	**WTI-10**	
Date Sampled		**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**720**	**720**	**720**	**720**	**730**	**720**	**702**	**711**	
		Concentration in microgram/cubic meter (µg/m^3)									
Metal	**Range**										**MDL***
Chromium	ND - 0.59						0.59				0.17
Iron	ND - 33	1.0	6.6	2.9		3.5	33	6.8		12	0.87
Lead	ND - 0.073			0.073			0.07				0.069
Manganese	ND - 1.3		1.3	0.33	1.3		1.3	0.17		0.18	0.17
Zinc	ND - 0.70		0.65	0.7						0.39	0.35

MDL: Method Detection Limit

*: MDL based on 730 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-10 East End of S. H. Bell

TABLE 21 (continued)
SUMMARY TABLE FOR METALS DETECTED IN AIR - ROUND #5
Dates Sampled December 5-10, 2000

Sample Number		**15800**	**15732**	**15691**	**15624**	**15648**	**15670**	**28474**	
Sampling Location		**WTI-11**	**WTI-11**	**WTI-11**	**WTI-11**	**WTI-11**	**WTI-11**	**WTI-11**	
Date Sampled		**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**356**	**720**	**693**	**756**	**701**	**720**	
		Concentration in microgram/cubic meter (µg/m^3)							
Metal	**Range**								**MDL***
Aluminum	ND - 3.5			3.5					1.7
Manganese	ND - 2.0	0.29	2.0		0.30				0.17
Sodium	ND - 23						23		17
Zinc	ND - 0.86	0.58	0.86				0.45	0.40	0.33

MDL: Method Detection Limit

*: MDL based on 756 Liters of sample volume

Average Media Blank Concentration >=MDL subtracted from all sample results

Sampling Location:

WTI-11 Cause Avenue at East end of S. H. Bell

TABLE 22

SUMMARY TABLE FOR VOCs DETECTED IN AIR - ROUND #5

Dates Sampled December 5-10, 2000

Sample Number		**15753**	**15763**	**15772**	**15794**	**15735**	**15808**	**15681**	**15634**	**15658**	**15740**	**15982**	**15751**	**15762**	**15770**	**15792**	**15806**	**15733**	**15683**	**15632**	**15656**	**15678**	**15980**	
Sampling Location		**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-1**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	**WTI-2**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**634**	**714**	**720**	**720**	**720**	**712**	**729**	**219**	**705**	**720**	**720**	**631**	**155**	**720**	**720**	**713**	**720**	**693**	**720**	**701**	**717**	
		Concentration in parts per billion by volume (ppbv)																						
Compound	**Range**																							**MDL***
Carbon Tetrachloride	ND-0.1 J																			0.1 J				0.5
Benzene	ND-0.7 J	0.3	0.2 J	0.2 J	0.4 J	0.4 J	0.3 J		0.4 J			0.6 J	0.3 J			0.2 J	0.3 J	0.2 J	0.3 J	0.5 J	0.3 J	0.3 J		0.9
Toluene	ND-0.9	0.3	0.4 J	0.3 J	0.3 J	0.4 J	0.3 J		0.8		0.8	0.8	0.2 J	0.21 J		0.2 J	0.2 J		0.4 J	0.5 J	0.3 J	0.3 J		0.7
Tetrachloroethene	ND-0.2 J																							0.4
para-Xylene	ND-0.4 J								0.2 J		0.3 J	0.34 J								0.2 J				0.6
ortho-Xylene	ND-0.1 J																							0.7

Sample Number		**15755**	**15764**	**15771**	**15793**	**15807**	**15734**	**15680**	**15633**	**15657**	**15679**	**15981**	**15757**	**15765**	**15773**	**15795**	**15809**	**15736**	**15682**	**15635**	**15659**	**15741**	**15983**	
Sampling Location		**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-5**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	**WTI-6**	
Date Sampled		**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	**5-Dec**	**5-Dec**	**6-Dec**	**6-Dec**	**7-Dec**	**7-Dec**	**8-Dec**	**8-Dec**	**9-Dec**	**9-Dec**	**10-Dec**	
Volume (Liters)		**720**	**635**	**713**	**720**	**720**	**896**	**715**	**691**	**720**	**702**	**720**	**720**	**610**	**711**	**720**	**720**	**790**	**706**	**694**	**792**	**704**	**720**	
		Concentration in parts per billion by volume (ppbv)																						
Compound	**Range**																							**MDL***
Carbon Tetrachloride	ND-0.1 J																							0.5
Benzene	ND-0.7 J	0.6 J	0.5 J		0.4 J	0.4 J	0.4 J	0.5 J	0.7 J	0.5 J	0.4 J	0.6 J		0.2 J	0.3 J	0.3 J		0.3 J	0.4 J	0.4 J	0.4 J	0.5 J	0.6 J	0.9
Toluene	ND-0.9	0.9	0.4 J		0.4 J	0.5 J	0.3 J	0.4 J	0.5 J	0.2 J	0.4 J	0.9		0.2 J	0.4 J	0.3 J		0.3 J	0.5 J	0.6 J	0.3 J	0.8	0.9	0.7
Tetrachloroethene	ND-0.2 J		0.2 J																					0.4
para-Xylene	ND-0.4 J	0.3 J			0.2 J	0.3 J													0.2 J			0.3 J	0.4 J	0.6
ortho-Xylene	ND-0.1 J																						0.1 J	0.7

J: The value is below the method detection limit and is estimated

MDL: Method Detection Limit

*: MDL based on 896 Liters of sample volume

Sampling Locations:

WTI-1 Roof of Administration Building

WTI-2 Water Treatment Plant

WTI-5 End of Walter Street

WTI-6 Port Authority Parking Area

Table 23
SUMMARY TABLE FOR METALS IN SOIL - ROUND #1
Date Sampled October 26, 2000
(results based on dry weight)

Sample Number		23900	23901	23902	23903	23904	23905	23906	23907	23908	23909		
Sampling Location		School	School	School	Playground	Playground	Playground	Snack Shack	HomePlate	Center Field	Bank of Ohio River		Eastern US
Date Sampled		26-Oct	26-Oct	26-Oct	26-Oct	26-Oct	26-Oct	26-Oct	26-Oct	26-Oct	26-Oct		Background
Percent Solids		85.2	79.5	84.7	87.4	86.2	90.4	83.3	88.6	88.9	86.2		Data**
		Concentration in milligram/kilogram (mg/kg)											
Metal	**Range**											**MDL***	
Aluminum	6330-13900	6660	13900	8550	7130	6990	6330	8670	8170	9070	8800	22.1	33000
Arsenic	11.3-36.6	13.5	14.5	14.5	13.8	36.6	12.9	11.6	11.3	11.5	16	1.1	3-12
Barium	77.9-243	92.9	125	125	105	103	77.9	118	78.8	243	112	22.1	15 - 600
Beryllium	0.8-1.1	0.85	1.1	0.88	0.81	0.85	0.8	0.98	0.91	1	0.89	0.55	0 - 1.75
Calcium	896-26500	2920	3440	1470	3910	9010	9790	2890	26500	3000	896	553	130 -35000
Chromium	12.4-27	14.1	26.2	15	14.4	13.9	20.6	19.9	12.4	18.7	27	1.1	15-40
Cobalt	7.2-11.4	8.4	11.4	9.7	8.3	10.6	8.5	10.1	7.8	9.2	7.2	5.5	2.5-60
Copper	16.7-38.6	20.6	38.6	21	19.8	23.8	22.9	24.8	16.7	23.6	19.7	2.8	1-50
Iron	23000-65200	65200	40300	26800	29500	40000	28400	27500	23000	26200	25700	11.1	2000-550000
Lead	20.1-1220	35.6	64.3	42.1	35.7	38.4	27.4	41.1	20.1	31.7	1220	0.33	4-500
Potassium	ND-1290	616	948	620	626	607	809	731	737	1290		553	8500-43000
Magnesium	1040-4900	1160	1600	1490	2170	4900	2720	1830	4640	2620	1040	553	100-5000
Manganese	485-968	833	944	886	899	934	700	863	695	485	968	1.7	50-5000
Mercury	ND-0.19	0.089	0.12	0.079	0.069	0.087	0.057	0.19		0.074	0.07	0.037	0.001-0.2
Nickel	15.1-24.9	15.2	24.9	18.1	17.1	19.3	21.6	22.5	15.1	20.2	22.4	4.4	0.5-25
Vanadium	15.3-22.4	20	21.7	17.8	16.9	17.4	15.3	18.3	15.5	22.4	20.1	5.5	1-300
Zinc	82.9-220	110	164	104	220	155	154	119	83.3	82.9	110	3.3	9-50

MDL: Method detection limit
*: MDL based on 90.4 percent solids
**: New York Department of Environmental Conservation, Jan 24, 1994

Matrix/Matrix Spike Duplicate (MS/MSD) percent recoveries for sample number 23905 was greater than 125 percent for Ca (196, 160%), Cr (474%), Cu (168%), and Zn (126%). All results for these metals are estimated.

Sample number 23905 was used for serial dilution. Following elements were greater than or equal to 50 times the instrument detection limit and exceeded the less than or equal to 10% difference (D) criteria: As (12.2%), Ba (10.1%), Co (11.3%), Cr (11.4%), Mn (10.3%), Ni (1590%), and Zn (10.7%). All results for these metals are estimated.

Table 24
SUMMARY TABLE FOR DIOXINS DETECTED IN SOIL-ROUND #1
Date Sampled October 26, 2000
(results based on dry weight)

Sample No.		23840		23841		23842		23843		23844		23845		23846		23847		23848		23849	
Sampling Location		**School**		**School**		**School**		**Playground**		**Playground**		**Playground**		**Snack Shack**		**Homeplate**		**Center Field**		**Bank of Ohio River**	
Date sampled		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**		**10/26/00**	
Percent Solids		**87.3**		**79.8**		**83.5**		**87.5**		**89.4**		**88**		**82.4**		**88.4**		**87.5**		**75**	
		Concentration in parts per trillion (ppt)																			
		Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC
Compound	**MDL***																				
2,3,7,8-TCDD	0.49	0.466 J		0.849		0.288 J			0.198		0.222		0.154		0.47	0.253 J			0.159	0.522 J	
1,2,3,7,8-PeCDD	2.5		1.36	1.45 J		0.578 J			0.607		0.416		0.442	0.97 J			0.332		0.293		2.91
1,2,3,4,7,8-HxCDD	2.5	1.02 J		1.33 J		0.387 J			0.351	0.259 J		0.293 J		0.71 J			0.169	0.253 J		3.03	
1,2,3,6,7,8-HxCDD	2.5	2.15 J		3.88			1.25	0.982 J		0.699 J		0.755 J		1.97 J		0.42 J		0.616 J		7.82	
1,2,3,7,8,9-HxCDD	2.5	2.01 J		3.07		0.947 J			0.694	0.536 J		0.773 J		1.7 J		0.465 J		0.695 J		7.66	
1,2,3,4,6,7,8-HpCDD	2.5	39.2		87.2		25.7		14.8		12.3		16		45.4		8.61		15.9		205	
OCDD	4.9	469		1010		363		191		165		268		787		112		535		1890	
2,3,7,8-TCDF	0.19	1.56		2.42		1.09		0.794		0.766		0.52		1.56		0.319 J		0.48		3.1	
1,2,3,7,8-PeCDF	2.5	0.844 J		1.37 J		0.563 J		0.477 J		0.411 J		0.305 J		0.857 J		0.115 J		0.255 J		1.91 J	
2,3,4,7,8-PeCDF	2.5	2.14 J		4.02		1.81 J		1.91 J		1.2 J		0.639 J		2.79		0.226		0.655 J		10.1	
1,2,3,4,7,8-HxCDF	2.5	1.69 J		3.15		1.31 J		0.894 J		0.904 J			0.576	2.05 J		0.197 J		0.45 J		5.54	
1,2,3,6,7,8-HxCDF	2.5	1.39 J		2.56		0.96 J		0.877 J		0.711 J		0.502 J		1.52 J		0.26 J		0.399 J		4.27	
2,3,4,6,7,8-HxCDF	2.5	1.62 J		2.89		1.2 J		1.23 J		0.891 J		0.571 J		1.67 J		0.224 J		0.491 J		7.3	
1,2,3,7,8,9-HxCDF	2.5	0.426 J		0.709 J		U		U		U		U		U		U		U		U	
1,2,3,4,6,7,8-HpCDF	2.5	13.1 J		27.3		11.5		5.84		5.32		4.1		15.4		1.59 J		3.12		97.4	
1,2,3,4,7,8,9-HpCDF	2.5	0.87 J		1.84 J		0.679 J		0.447 J		0.392 J		0.293 J		0.939 J		U		0.22 J		3.56	
OCDF	4.9	55		78		37.9		12.8		11.8		9.76		33.1		4.81		5.93		330	
Total TCDDs		7.54	9.11	13		4.57	4.62	5.54	5.74	2.33	2.9	1.33	1.640	5.88	6.56	0.554	0.847	1.52	2	6.86	7.9
Total PeCDDs		9.7	11.4	11.9	13.3	5.25	5.96	3.82	4.43	4.1	4.5	2.19	2.64	7.21	8.95	1.57	2.2	2.1	2.4	15.7	16.2
Total HxCDDs		29.2	32.2	35	36.5	12.40	13.7	9.43	10.7	8.38		8.5	9	21.3	21.3	5.4	5.8	7.17	8.1	64.5	
Total HpCDDs		102		200	200	66.9	66.9	34.5	34.5	27.1	27.1	38	38	103	103	21.4	21.4	34.5	34.5	397	
Total TCDFs		22	22.1	39.3	40.4	16.60	17.6	12.2	14	11.1	12.1	6.46	7.81	19.9	22.7	1.8	2.4	6.12	7.4	52	55
Total PeCDFs		14.5		26.7		11.10	19.6	10.7		7.6		4.8	7.57	15.8	28.4	1.4	2.7	3.3	6.6	53	
Total HxCDFs		21.2		43.6		17.1		15.1		10.9	11.1	6.39	6.97	25.7		2.6	2.9	5.53	5.8	116	
Total HpCDFs		25.4	26.3	64.6	65.8	27.6	28.3	11.9		10.5		8.43		30	30.9	3.5		6.93		225	
TEQ (ND=0)		3.82		7.90		2.88		1.87		1.45		1.16		4.48		0.83		1.42		14.8	
TEQ (ND=1/2)		3.84		7.90		2.91		1.96		1.51		1.25		4.48		0.755		1.48		14.9	
TEQ EMPC (ND=0)		4.5		7.90		3.00		2.48		1.88		1.59		4.95		0.958		1.72		16.3	
TEQ EMPC (ND=1/2)		4.5		7.90		3.02		2.49		1.89		1.6		4.98		0.968		1.74		16.3	

J: The value is below the method detection limit and is estimated
U: Not detected at Method Detection Limit (MDL)
*: MDL based on 89.4 percent solids
EMPC: Estimated maximum possible concentration
TEQ: Toxicity Equivalents

Table 25
SUMMARY TABLE FOR METALS IN SOIL - ROUND #4
Date Sampled November 15, 2000
(results based on dry weight)

Sample Number		SE-1A	SE-2A	SE-3A	SE-4A	WTI-5A	WTI-5C		
Sampling Location		Elem School	Elem School	Elem School	Elem School	Walter Street	Walter Street		Eastern US
Date Sampled		15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov		Background
Percent Solids		84.99	81.05	83.25	82.74	88.14	91.63		Data**
		Concentration in milligram/kilogram (mg/kg)							
Metal	**Range**							**MDL***	
Aluminum	4900-9300	8800	9300	8900	9200	5800	4900	17	33000
Arsenic	13-18	13	18	17	13	15	14	0.97	3-12
Barium	76-130	130	120	120	130	76	88	0.96	15 - 600
Berylium	0.73-1.0	0.98	1.0	0.86	0.94	0.83	0.73	0.48	0 - 1.75
Cadmium	ND-0.93	0.93	0.83			0.71		0.48	0.1-1
Calcium	2600-12000	2600	3800	4700	3300	2800	12000	48	130 -35000
Chromium	18-60	28	28	18	20	48	60	0.48	15-40
Cobalt	10-11	11	11	10	11	11	11	0.96	2.5-60
Copper	22-29	29	29	25	28	26	22	0.96	1-50
Iron	30000-42000	30000	34000	30000	32000	38000	42000	9.6	2000-550000
Lead	45-65	65	61	45	54	45	63	3.8	4-500
Magnesium	1500-2300	1600	2000	2300	1900	1500	2100	48	100-5000
Manganese	1000-1600	1100	1200	1100	1000	1500	1600	0.96	50-5000
Mercury	ND-0.13	0.13	0.12	0.085	0.096	0.11		0.04	.001-0.2
Nickel	20-24	22	24	20	21	24	22	0.96	0.5-25
Potassium	710-950	930	920	890	950	760	710	190	8500-43000
Vanadium	15-21	19	21	18	19	16	15	1.9	1-300
Zinc	110-220	220	200	120	140	120	110	1.9	9-50

MDL: Method Detection Limit
***:** Method detection limit based on 91.63 percent solids
: New York Department of Environmental Conservation, Jan 24, 1994

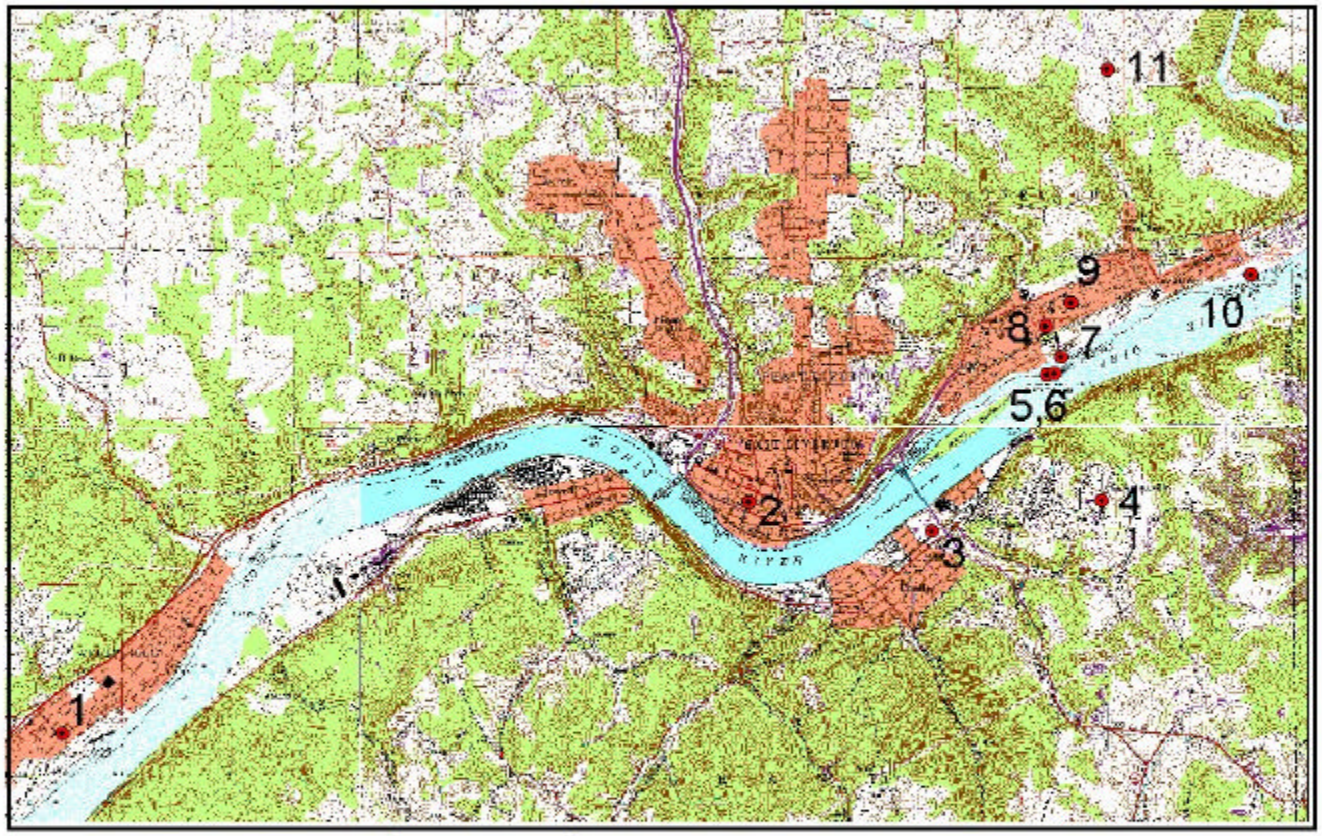
Table 26
SUMMARY TABLE FOR DIOXINS IN SOIL - ROUND #4
Date Sampled November 15, 2000
(results based on dry weight)

Sample Number		SE-1B		SE-2B		SE-3B		SE-4B		WTI-5B		WTI-5D	
Sampling Location		Elem School		Elem School		Elem School		Elem School		Walter Street		Walter Street	
Percent Solids		83.4		80.7		83.5		82.2		86.8		91.4	
		Concentration in parts per trillion (ppt)											
		Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC	Amount	EMPC
Compound	**MDL***												
2,3,7,8-TCDD	0.49		0.521		0.416		0.245		0.260		0.176		0.140
1,2,3,7,8-PeCDD	2.5	1.25 J		0.661 J		0.321 J		0.332 J		0.281 J		0.255 J	
1,2,3,4,7,8-HxCDD	2.5	1.34 J		0.647 J		0.359 J			0.308	0.236 J		0.269 J	
1,2,3,6,7,8-HxCDD	2.5	3.37		1.76 J		0.796 J		0.82 J		0.612 J		0.563 J	
1,2,3,7,8,9-HxCDD	2.5	2.98		1.68 J		0.914 J		0.708 J		0.481 J			0.506
1,2,3,4,6,7,8-HpCDD	2.5	84.3		38.3		17.5		17.9		12.1		10.8	
OCDD	4.9	728		328		209		196		112		93.2	
2,3,7,8-TCDF	2.5	3.62		0.631		0.431 J		0.482 J		0.188 J			0.104
1,2,3,7,8-PeCDF	2.5	4.69		0.455 J		0.268 J		0.37 J		0.168 J		0.100 J	
2,3,4,7,8-PeCDF	2.5	2.77		0.99 J		0.751 J		1.02 J		0.672 J		0.247 J	
1,2,3,4,7,8-HxCDF	2.5	5.40		1.15 J		0.61 J		0.858 J		0.539 J		0.419 J	
1,2,3,6,7,8-HxCDF	2.5	2.55		1.24 J		0.454 J		0.624 J		0.404 J		0.299 J	
2,3,4,6,7,8-HxCDF	2.5	2.60		1.40 J		0.581 J		0.898 J		0.576 J		0.344 J	
1,2,3,7,8,9-HxCDF	2.5	1.27 J		0.196 J				0.204 J					
1,2,3,4,6,7,8-HpCDF	2.5	22.9		12.8		4.64		6.00		4.91		4.58	
1,2,3,4,7,8,9-HpCDF	2.5	2.30 J		0.59 J		0.338 J		0.344 J		0.305 J		0.298 J	
OCDF	4.9	62.9		16.2		11.6		12.2		11.9		11.2	
Total TCDDs		6.76	7.76	4.28	4.70	1.7	2.11	1.61	2.11	0.217	0.393		0.140
Total PeCDDs		12.2	12.8	6.83	7.31	2.95		2.24	3.94	0.744	1.14	0.82	0.823
Total HxCDDs		38.4	32.5	23.7	25.2	8.00	8.19	7.87	8.64	4.21	4.32	3.69	4.38
Total HpCDDs		226		98.6		41.0		45.0		23.5		20.6	
Total TCDFs		27.5	28.6	9.97	10.1	5.90	6.58	8.52	9.87	2.11	3.93	1.3	1.45
Total PeCDFs		20.6	28.7	8.2	8.3	4.70	7.09	6.5	10.2	2.9	6.23	1.4	2.38
Total HxCDFs		38.5		18.4	18.7	7.13	7.42	10.1		7.37	7.55	4.88	5.04
Total HpCDFs		55.6		23.3		10.9		12.7	13	11.8	11.9	10.6	
TEQ (ND=0)		6.44		2.58		1.41		1.60		1.09		0.707	
TEQ (ND=1/2)		6.47		2.60		1.45		1.65		1.12		0.741	
TEQ EMPC (ND=0)		6.96		3.00		1.65		1.90		1.26		0.908	
TEQ EMPC (ND=1/2)		6.96		3.00		1.66		1.90		1.27		0.912	

MDL: Method detection limit
*: Method detection limit is based on 91.4 percent solids
J: The value is below the method detection limit and is estimated
EMPC: Estimated maximum possible concentration
TEQ: Toxicity Equivalents

Figures

Previous Air Sampling Locations



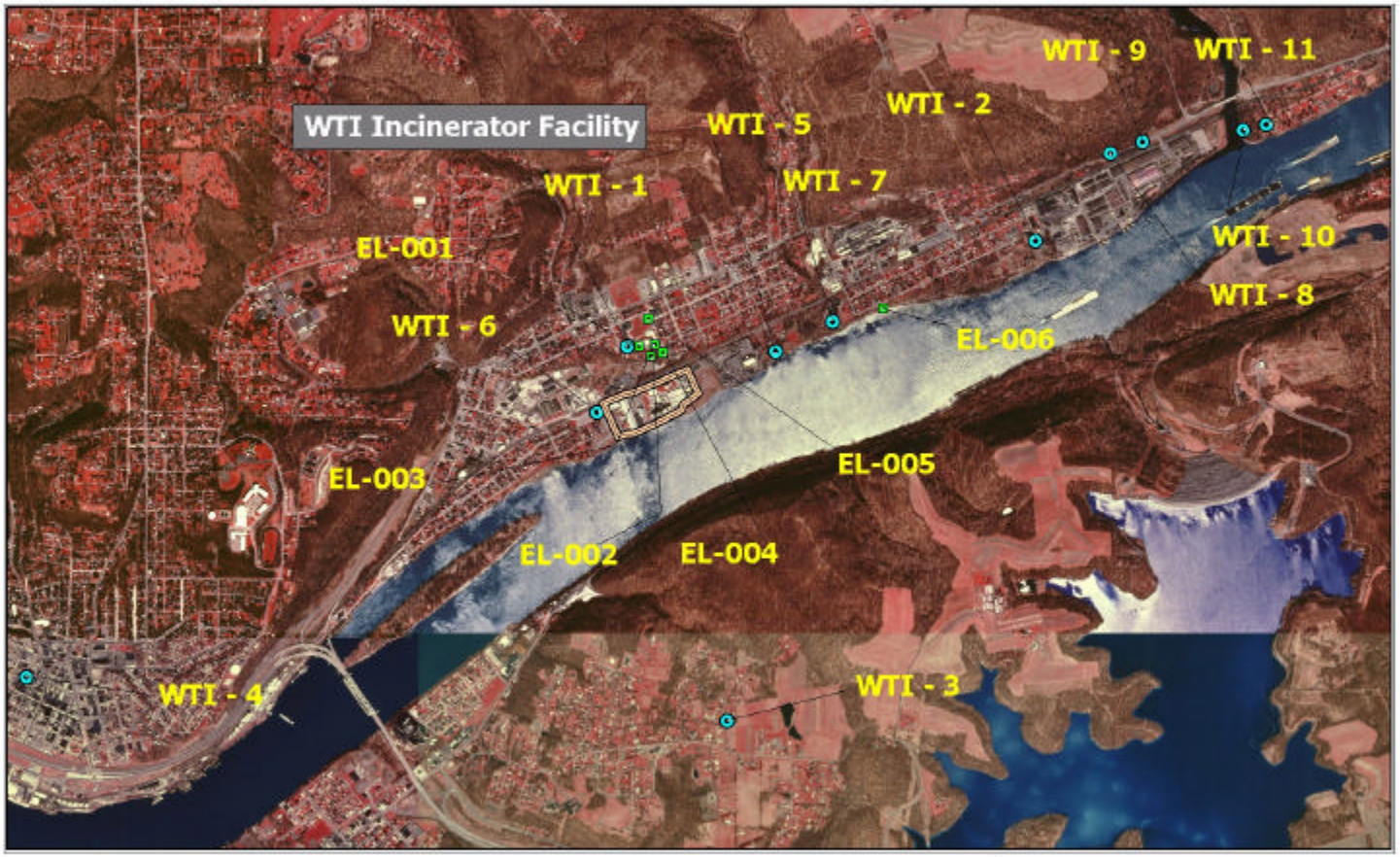
Site	Location	State
1	Wellsville	OH
2	City Hall	OH
3	Chester	WV
4	Lawrenceville	WV
5	Plant - West 1	OH
6	Plant - West 2	OH
7	Plant - East	OH
8	School	OH
9	Firehouse	OH
10	Treatment Plant	OH
11	Stagecoach	OH

Map created using USGS topographic map. Map depicts monitor sites in East Liverpool, OH and Chester, WV area.

U.S. EPA Environmental Response Team Center
Response Engineering and Analytical Contract
68-C99-223
W.O.#R1A00180

Figure 1
Previous Air Sampling Locations
Chester, West Virginia and
East Liverpool, Ohio

Air Sampling Locations



Legend

- October 25 - November 12, 2000 Sampling Points
- November 13 - December 10, 2000 Sampling Points

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Figure 2
Air Sampling Locations
WTI Incinerator Site
East Liverpool, Ohio

Soil Sampling Locations

Legend

- October 26, 2000 Sample Points
- November 15, 2000 Sample Points

Data: g:\arcviewprojects\180

.apr file: g:\arcviewprojects\0_REAC_SProjects\180_slp.apr

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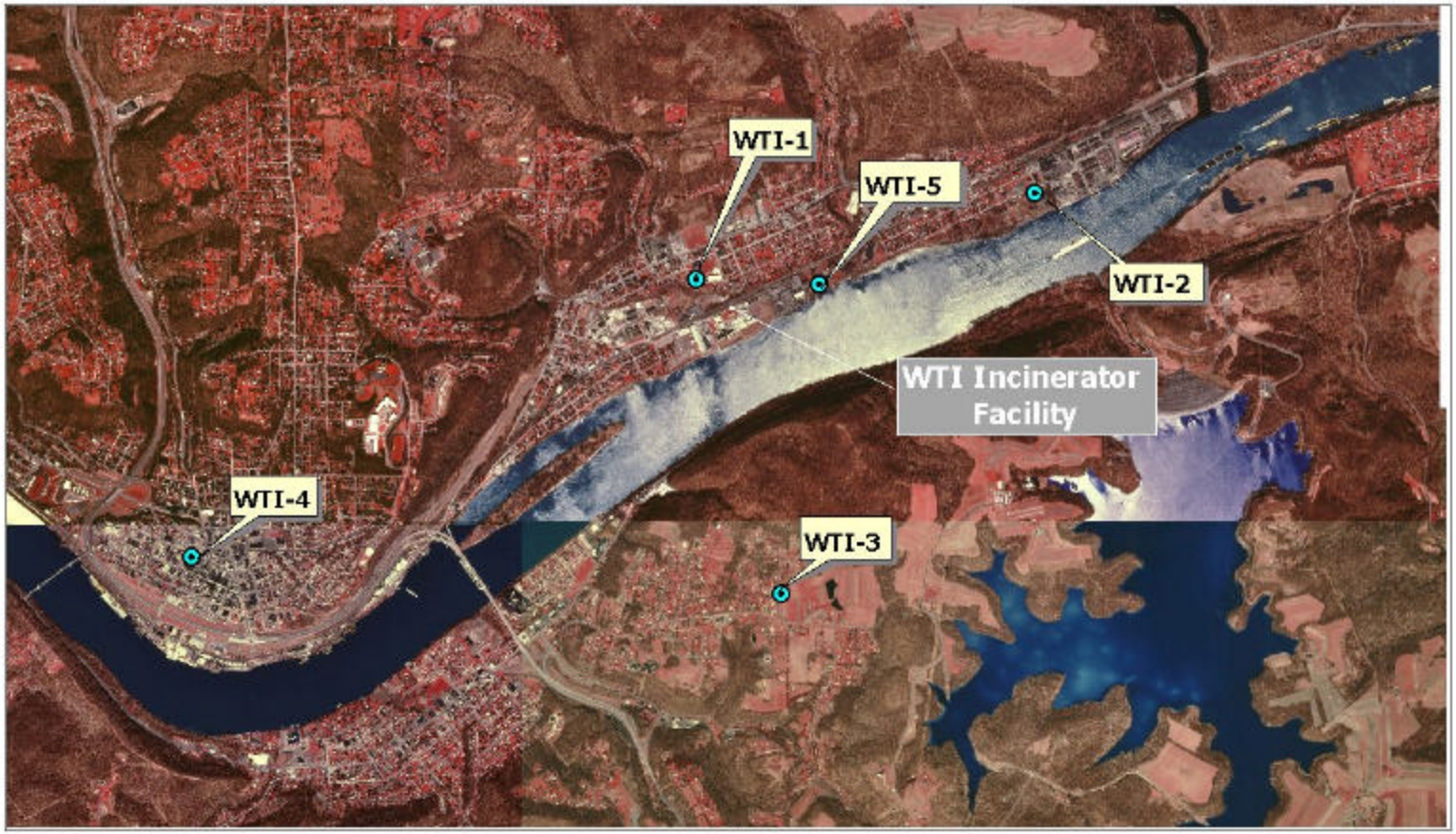
Figure 3
Soil Sampling Locations
WTI Incinerator Site
East Liverpool, Ohio

Air Sampling Locations



Map created using USGS digital orthophoto quads, color infra-red imagery highlights vegetation health

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Figure 4
Air Sampling Locations
East Liverpool, Ohio
October / November, 2000

Figure 5
Air Sampling Location EL-001
Sampling Rounds #1 - 2
Elementary School at SW Corner
Etruria Street, East Liverpool, Ohio

Figure 6
Air Sampling Location EL-002
Sampling Rounds #1 - 3
Elementary School at Entrance
Etruria Street, East Liverpool, Ohio

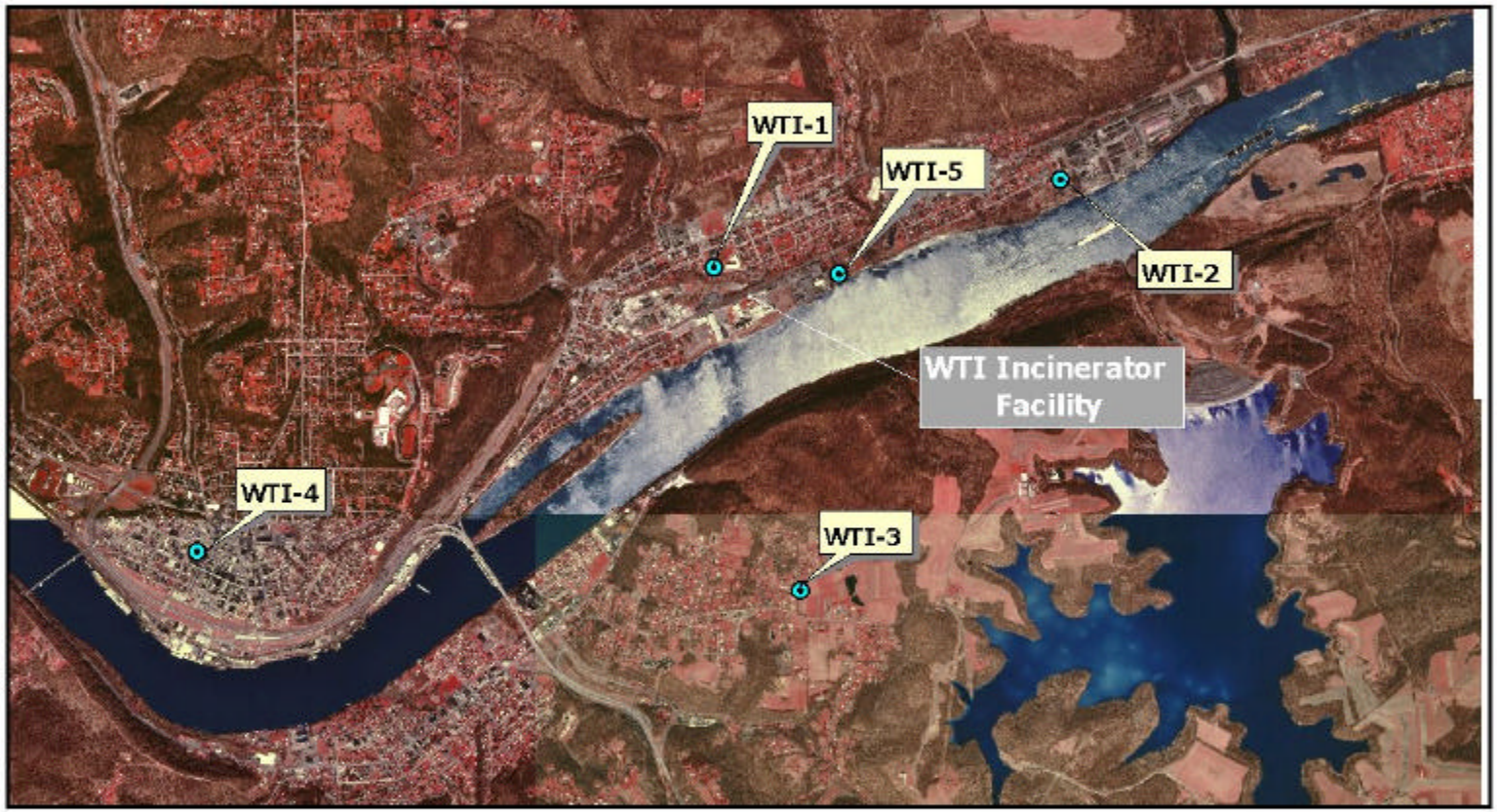
Figure 7
Air Sampling Location EL-003
Sampling Rounds #1 - 3
Back yard of E House on Etruria Street
East Liverpool, Ohio

Figure 8
Air Sampling Location EL-004
Sampling Rounds #1 - 3
Side yard of C House Garage on Etruria Street near garage
East Liverpool, Ohio

Figure 9
Air Sampling Location EL-005
Sampling Rounds #1 – 3
Elementary School Playground (Snack Shack)
Martin Street Across From Globe Street, East Liverpool, Ohio

Figure 10
Air Sampling Location EL-006
Sampling Rounds #1 - 3
Bank of Ohio River across from 1911 Ohio Avenue
East Liverpool, Ohio

Air Sampling Locations



Map created using USGS digital orthophoto quads, color infra-red imagery highlights vegetation health

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Response Engineering and Analytical Contract
68-C99-223
W.O.#R1A00180

Figure 11
Air Sampling Locations
East Liverpool, Ohio
November, 2000

Figure 12
Air Sampling Location EL-001, Sampling Round #3
Air Sampling Location WTI-1, Sampling Rounds #4 and 5
Roof of Administration Building
Etruria Street, East Liverpool, Ohio

Figure 13
Air Sampling Location WTI-2
Sampling Rounds #4 and 5
Water Treatment Plant
East Liverpool, Ohio

Figure 14
Air Sampling Location WTI-3
Sampling Rounds #4 and 5
West Virginia DEP Site
Tyrone Road, Lawrenceville, West Virginia

Figure 15
Air Sampling Location WTI-4
Sampling Rounds #4 and 5
Roof of East Liverpool City Hall
6th Street, East Liverpool, Ohio

Figure 16
Air Sampling Location WTI-5
Sampling Rounds #4 and 5
End of Walter Street (North Bank of Ohio River)
East Liverpool, Ohio

Air Sampling Locations

Map created using USGS
digital orthophoto quads, color infra-red
imagery highlights vegetation health

1 0 1 Kilometers

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Figure 17
Air Sampling Locations
East Liverpool, Ohio
December 2000

Figure 18
Air Sampling Location WTI-2A
Sampling Round #5
PM10 Location at Water Treatment Plant
East Liverpool, Ohio

Figure 19
Air Sampling Location WTI-6
Sampling Round #5
Port Authority Parking Area (Columbiana County)
Adjacent to WTI Facility, East Liverpool, Ohio

Figure 20
Air Sampling Location WTI-7
Sampling Round #5
West End of Ohio Avenue
North Bank of Ohio River, East Liverpool, Ohio

Figure 21
Air Sampling Location WTI-8
Route 39 At Ohio/Pennsylvania Monument
East Liverpool, Ohio

Figure 22
Air Sampling Location WTI-9
Sampling Round #5
Route 39E at Entrance, Pennsylvania

Figure 23
Air Sampling Location WTI-10
Sampling Round #5
East End of S. H. Bell, Pennsylvania

Figure 24
Air Sampling Location WTI-11
Sampling Round #5
Cause Avenue at East end of S. H. Bell
Midland, Pennsylvania

Soil Sampling Locations

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68-C99-223
W.O. # R1A00180

Figure 25
Soil Sampling Locations
WTI Incinerator Site
East Liverpool, Ohio
October 2000

Data: g:\arcviewprojects\180

.apr file: g:\arcviewprojects\0_REAC_EPprojects\180_elp.apr

Figure 26
Soil Sampling Location EES-1
Sampling Round #1
SW Corner of School
Etruria Street, East Liverpool, Ohio

Figure 27
Soil Sampling Location EES-2
Sampling Round #1
Elementary School Entrance
Etruria Street, East Liverpool, Ohio

Figure 28
Soil Sampling Location EES-3
Sampling Round #1
SE Corner of Elementary School
Etruria Street, East Liverpool, Ohio

Figure 29
Soil Sampling Location EES-4
Sampling Round #1
Elementary School Playground Swing Set
Martin Street, East Liverpool, Ohio

Figure 30
Soil Sampling Location EES-5
Sampling Round #1
Elementary School Playground Ladder
Martin Street, East Liverpool, Ohio

Figure 31
Soil Sampling Location EES-6
Sampling Round #1
Elementary School Bottom of Slide
Martin Street, East Liverpool, Ohio

Figure 32
Soil Sampling Location EES-7
Sampling Round #1
W. Side Snack Shack
Martin Street, East Liverpool, Ohio

Figure 33
Soil Sampling Location EES-8
Sampling Round #1
Home Base - Elementary School Playground
Martin Street, East Liverpool, Ohio

Figure 34
Soil Sampling Location EES-9
Sampling Round #1
Center Field – Elementary School Playground
East Liverpool, Ohio

Figure 35
Soil Sampling Location EES-10
Sampling Round #4
North Bank of Ohio River at Ohio Avenue
East Liverpool, Ohio

Soil Sampling Locations

Map created using USGS
digital orthophoto quads, color infra-red
imagery highlights vegetation health

U.S. EPA Environmental Response Team Center
Response Engineering and Analytical Contract
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Figure 36
Soil Sampling Locations
East Liverpool, Ohio
November, 2000

Figure 37
Soil Sampling Location SE-1
Sampling Round #4
SE Corner of School
Etruria Street, East Liverpool, Ohio

NO PHOTOGRAPH WAS TAKEN FOR THIS LOCATION. SAMPLING WAS DONE VERY CLOSE TO THE LOCATION SHOWN IN FIGURE 26.

Figure 38
Soil Sampling Location SE-2
Sampling Round #4
SW Corner of School
Etruria Street, East Liverpool, Ohio

Figure 39
Soil Sampling Location SE-3
Sampling Round #4
Front of School
Etruria Street, East Liverpool, Ohio

Figure 40
Soil Sampling Location SE-4
Sampling Round #4
School Entrance
Etruria Street, East Liverpool, Ohio

Figure 41
Soil Sampling at Site WTI-5
Sampling Round #4
End of Walter Street
East Liverpool, Ohio

Figure 42
East Liverpool, Ohio

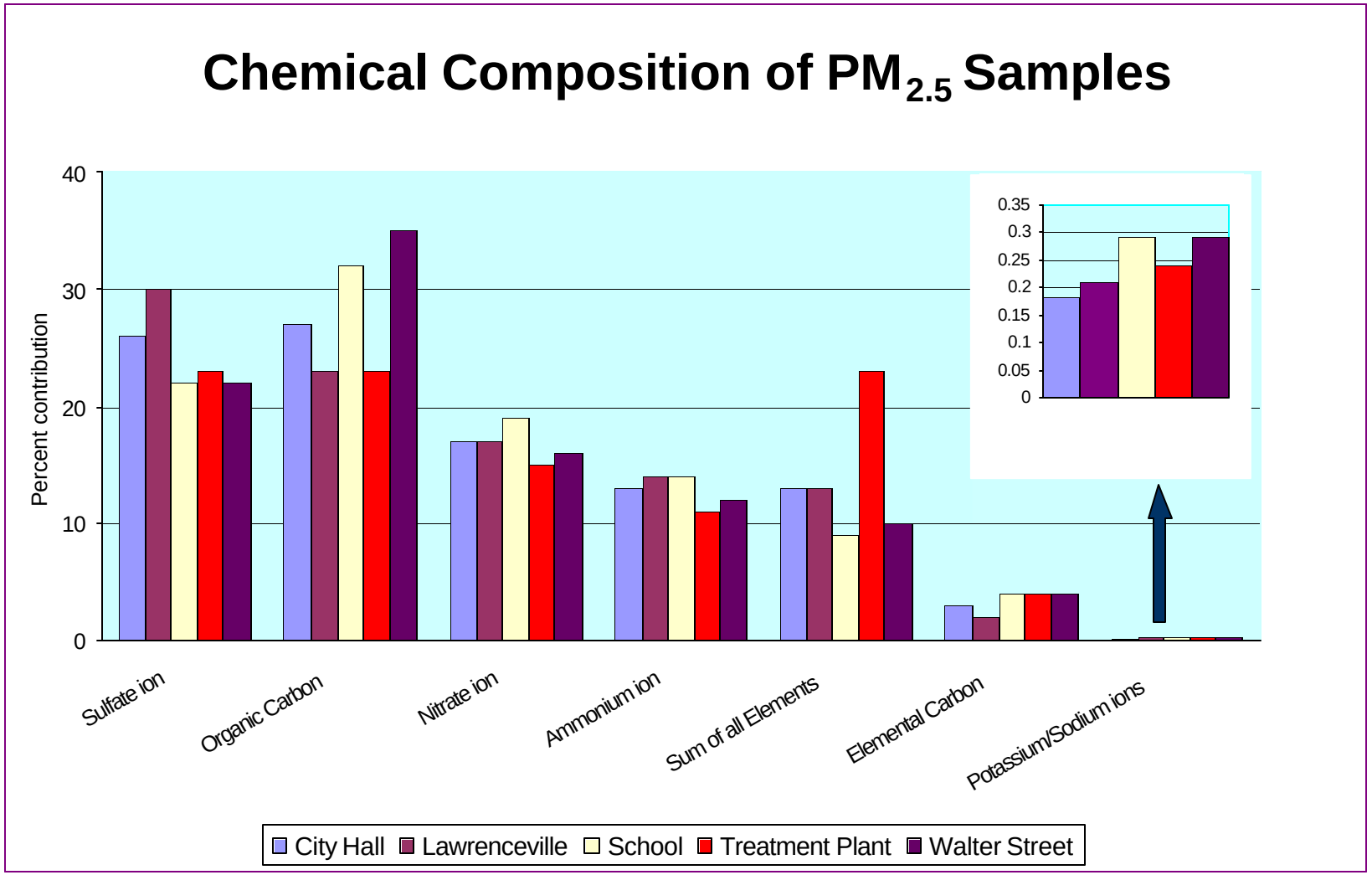

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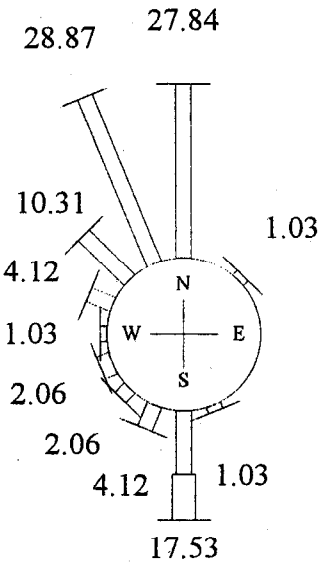
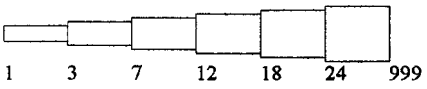
Figure 43
East Liverpool, Ohio
1 November 2000 14:30 - 1 November 2000 22:30
Sampling Location EL-002



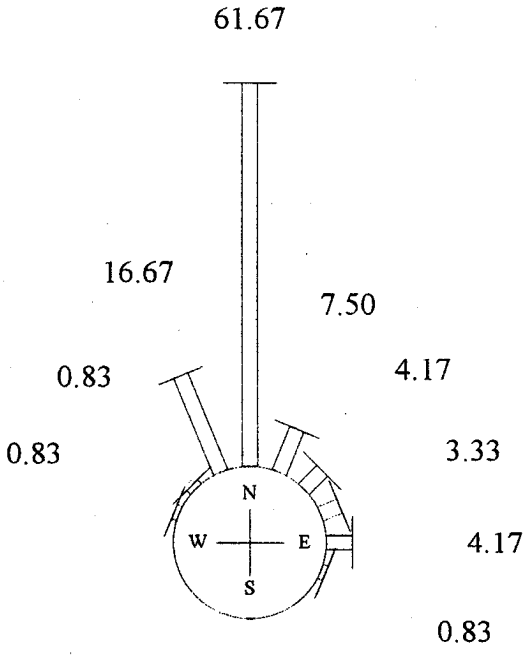


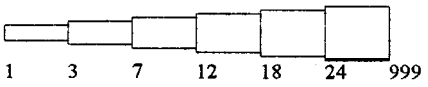
SCALE (MPH)

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	> 24
N	27.84	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	1.03	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	1.03	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	> 24
S	10.31	7.22	0.00	0.00	0.00	0.00
SSW	4.12	0.00	0.00	0.00	0.00	0.00
SW	2.06	0.00	0.00	0.00	0.00	0.00
WSW	0.00	2.06	0.00	0.00	0.00	0.00
W	1.03	0.00	0.00	0.00	0.00	0.00
WNW	4.12	0.00	0.00	0.00	0.00	0.00
NW	10.31	0.00	0.00	0.00	0.00	0.00
NNW	28.87	0.00	0.00	0.00	0.00	0.00

Figure 44
East Liverpool, Ohio
1 November 2000 23:00 - 2 November 2000 7:00
Sampling Location EL-002



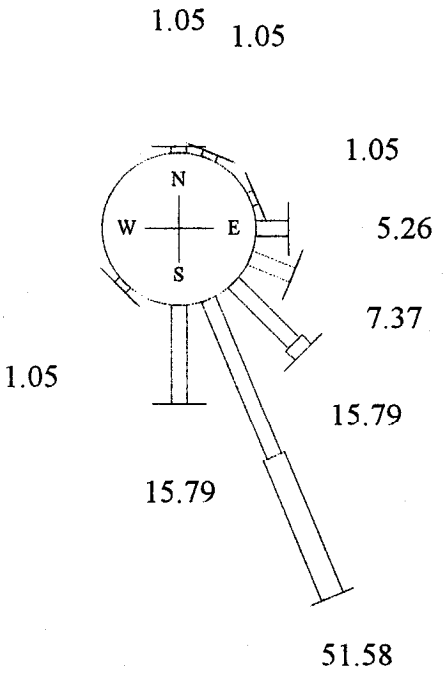


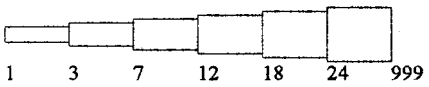
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	> 24
N	61.67	0.00	0.00	0.00	0.00	0.00
NNE	7.50	0.00	0.00	0.00	0.00	0.00
NE	4.17	0.00	0.00	0.00	0.00	0.00
ENE	3.33	0.00	0.00	0.00	0.00	0.00
E	4.17	0.00	0.00	0.00	0.00	0.00
ESE	0.83	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	> 24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.83	0.00	0.00	0.00	0.00	0.00
NW	0.83	0.00	0.00	0.00	0.00	0.00
NNW	16.67	0.00	0.00	0.00	0.00	0.00

Figure 45
East Liverpool, Ohio
2 November 2000 7:00 - 2 November 2000 15:00
Sampling Location EL-002



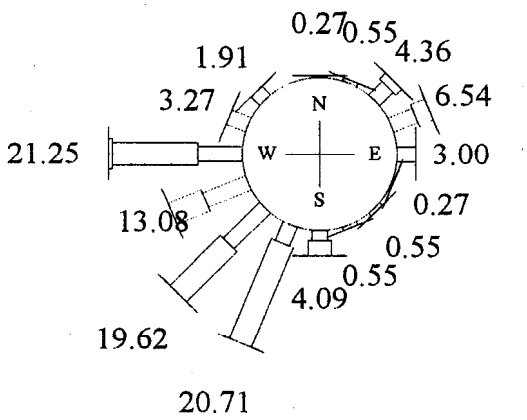


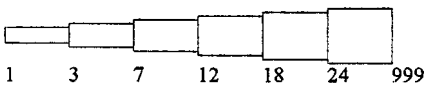
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	1.05	0.00	0.00	0.00	0.00	0.00
NNE	1.05	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	1.05	0.00	0.00	0.00	0.00	0.00
E	5.26	0.00	0.00	0.00	0.00	0.00
ESE	7.37	0.00	0.00	0.00	0.00	0.00
SE	13.68	2.11	0.00	0.00	0.00	0.00
SSE	27.37	24.21	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	15.79	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	1.05	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 46
East Liverpool, Ohio
13 November 2000 7:00 - 14 November 2000 15:00
Sampling Location WTI-1





SCALE (MPH)

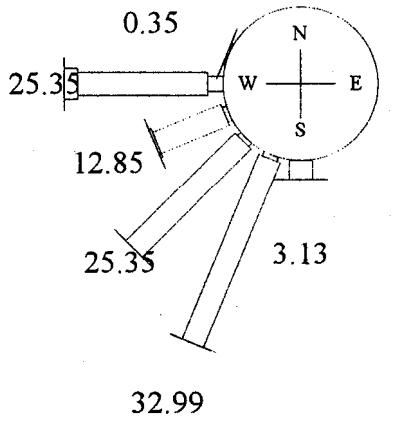
WI-ND SPEED (MPH) PERCENT OCCURRENCE

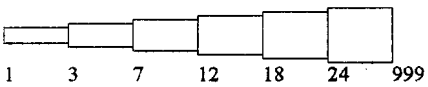
	1-3	3-7	7-12	12-18	18-24	>24
N	0.27	0.00	0.00	0.00	0.00	0.00
NNE	0.55	0.00	0.00	0.00	0.00	0.00
NE	3.00	1.36	0.00	0.00	0.00	0.00
ENE	4.09	2.45	0.00	0.00	0.00	0.00
E	3.00	0.00	0.00	0.00	0.00	0.00
ESE	0.27	0.00	0.00	0.00	0.00	0.00
SE	0.55	0.00	0.00	0.00	0.00	0.00
SSE	0.55	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE

	1-3	3-7	7-12	12-18	18-24	>24
S	1.63	2.45	0.00	0.00	0.00	0.00
SSW	3.27	17.44	0.00	0.00	0.00	0.00
SW	8.17	11.44	0.00	0.00	0.00	0.00
WSW	7.36	5.72	0.00	0.00	0.00	0.00
W	7.08	13.62	0.55	0.00	0.00	0.00
WNW	3.27	0.00	0.00	0.00	0.00	0.00
NW	1.91	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 47
East Liverpool, Ohio
14 November 2000 14:00 - 15 November 2000 14:00
Sampling Location WTI-1



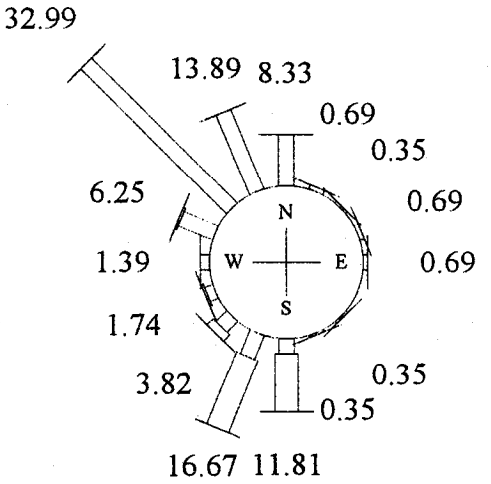


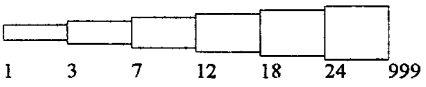
SCALE (MPH)

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	3.13	0.00	0.00	0.00	0.00
SSW	0.69	32.29	0.00	0.00	0.00	0.00
SW	0.69	24.65	0.00	0.00	0.00	0.00
WSW	0.69	11.81	0.35	0.00	0.00	0.00
W	2.43	20.83	2.08	0.00	0.00	0.00
WNW	0.00	0.35	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 48
East Liverpool, Ohio
15 November 2000 14:00 - 16 November 2000 14:00
Sampling Location WTI-1



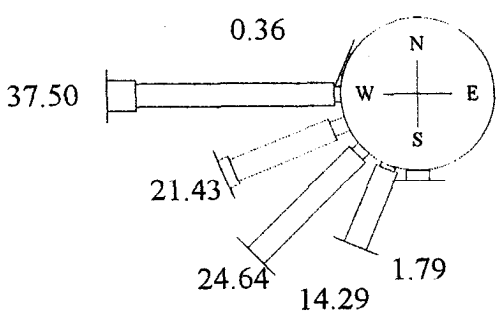


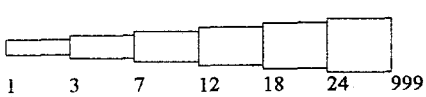
SCALE (MPH)

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	8.33	0.00	0.00	0.00	0.00	0.00
NNE	0.69	0.00	0.00	0.00	0.00	0.00
NE	0.35	0.00	0.00	0.00	0.00	0.00
ENE	0.69	0.00	0.00	0.00	0.00	0.00
E	0.69	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.35	0.00	0.00	0.00	0.00	0.00
SSE	0.35	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	2.43	9.38	0.00	0.00	0.00	0.00
SSW	4.17	12.50	0.00	0.00	0.00	0.00
SW	2.43	1.39	0.00	0.00	0.00	0.00
WSW	1.39	0.35	0.00	0.00	0.00	0.00
W	1.39	0.00	0.00	0.00	0.00	0.00
WNW	5.90	0.35	0.00	0.00	0.00	0.00
NW	32.99	0.00	0.00	0.00	0.00	0.00
NNW	13.89	0.00	0.00	0.00	0.00	0.00

Figure 49
East Liverpool, Ohio
16 November 2000 14:00 - 17 November 2000 14:00
Sampling Location WTI-1



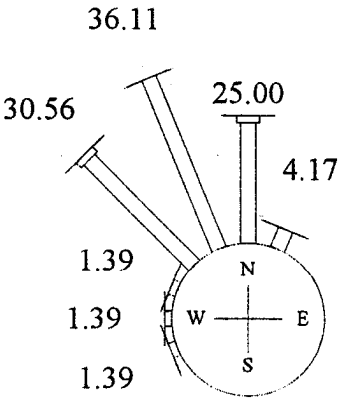


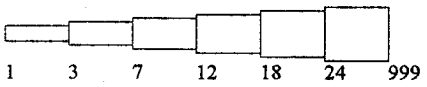
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	1.79	0.00	0.00	0.00	0.00
SSW	0.71	13.57	0.00	0.00	0.00	0.00
SW	1.43	23.21	0.00	0.00	0.00	0.00
WSW	2.50	17.14	1.79	0.00	0.00	0.00
W	1.07	31.79	4.64	0.00	0.00	0.00
WNW	0.00	0.36	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 50
East Liverpool, Ohio
1 November 2000 14:30 - 1 November 2000 22:30
Sampling Location WTI-2



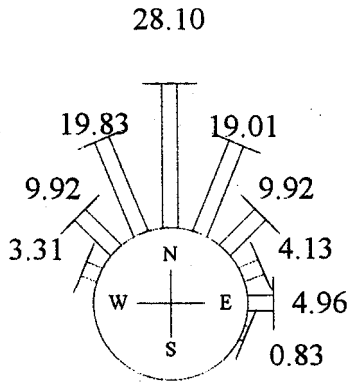


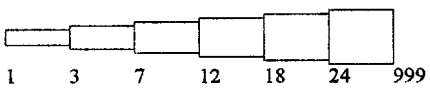
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	23.61	1.39	0.00	0.00	0.00	0.00
NNE	4.17	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	1.39	0.00	0.00	0.00	0.00	0.00
W	1.39	0.00	0.00	0.00	0.00	0.00
WNW	1.39	0.00	0.00	0.00	0.00	0.00
NW	29.17	1.39	0.00	0.00	0.00	0.00
NNW	36.11	0.00	0.00	0.00	0.00	0.00

Figure 51
East Liverpool, Ohio
1 November 2000 23:00 - 15 November 2000 7:00
Sampling Location WTI-2



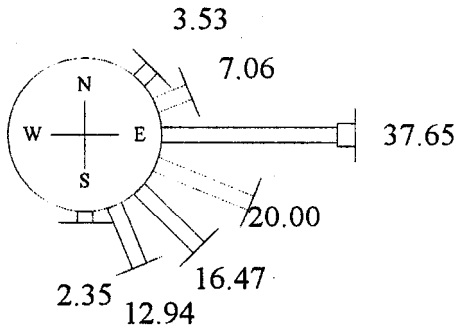


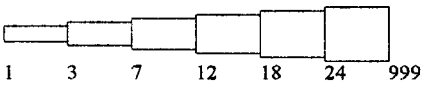
SCALE (MPH)

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	28.10	0.00	0.00	0.00	0.00	0.00
NNE	19.01	0.00	0.00	0.00	0.00	0.00
NE	9.92	0.00	0.00	0.00	0.00	0.00
ENE	4.13	0.00	0.00	0.00	0.00	0.00
E	4.96	0.00	0.00	0.00	0.00	0.00
ESE	0.83	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	3.31	0.00	0.00	0.00	0.00	0.00
NW	9.92	0.00	0.00	0.00	0.00	0.00
NNW	19.83	0.00	0.00	0.00	0.00	0.00

Figure 52
East Liverpool, Ohio
2 November 2000 7:00 - 2 November 2000 15:00
Sampling Location WTI-2



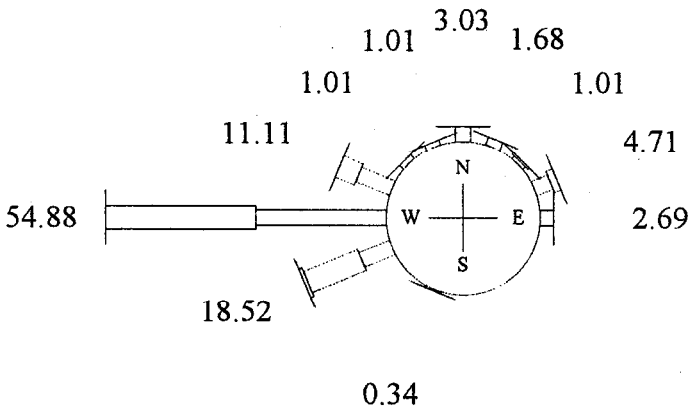


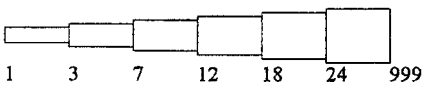
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	3.53	0.00	0.00	0.00	0.00	0.00
ENE	7.06	0.00	0.00	0.00	0.00	0.00
E	34.12	3.53	0.00	0.00	0.00	0.00
ESE	20.00	0.00	0.00	0.00	0.00	0.00
SE	16.47	0.00	0.00	0.00	0.00	0.00
SSE	12.94	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	2.35	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 53
East Liverpool, Ohio
13 November 2000 14:00 - 14 November 2000 14:00
Sampling Location WTI-2





SCALE (MPH)

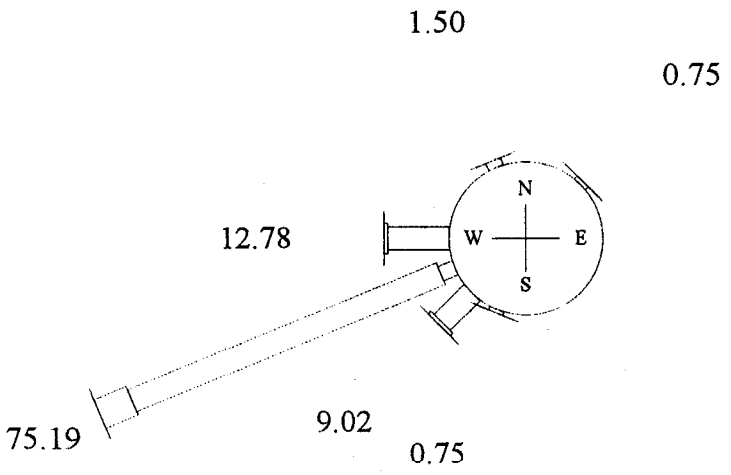
WIND SPEED (MPH) PERCENT OCCURRENCE

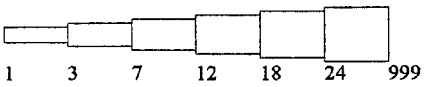
	1-3	3-7	7-12	12-18	18-24	>24
N	3.03	0.00	0.00	0.00	0.00	0.00
NNE	1.68	0.00	0.00	0.00	0.00	0.00
NE	0.67	0.34	0.00	0.00	0.00	0.00
ENE	3.37	1.35	0.00	0.00	0.00	0.00
E	2.69	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE

	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.34	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	6.40	11.45	0.67	0.00	0.00	0.00
W	25.59	29.29	0.00	0.00	0.00	0.00
WNW	7.07	4.04	0.00	0.00	0.00	0.00
NW	1.01	0.00	0.00	0.00	0.00	0.00
NNW	1.01	0.00	0.00	0.00	0.00	0.00

Figure 54
East Liverpool, Ohio
4 December 2000 20:00 - 5 December 2000 9:00
Sampling Location WTI-2



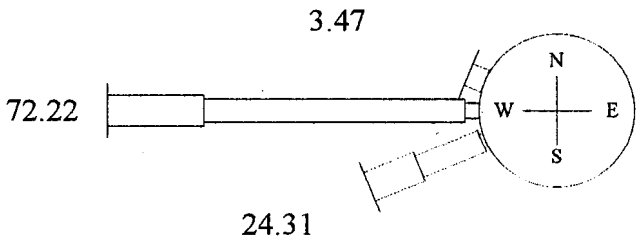


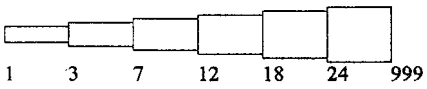
SCALE (MPH)

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.75	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.75	0.00	0.00	0.00	0.00	0.00
SW	0.00	8.27	0.75	0.00	0.00	0.00
WSW	3.01	65.41	6.77	0.00	0.00	0.00
W	0.00	12.03	0.75	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	1.50	0.00	0.00	0.00	0.00	0.00

Figure 55
East Liverpool, Ohio
5 December 2000 9:00 - 5 December 2000 20:00
Sampling Location WTI-2





SCALE (MPH)

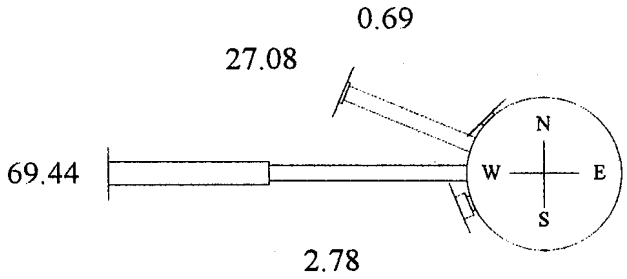
WIND SPEED (MPH) PERCENT OCCURRENCE

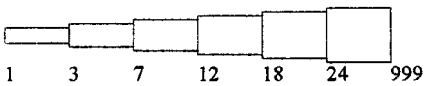
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE

	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.69	13.19	10.42	0.00	0.00	0.00
W	2.78	50.69	18.75	0.00	0.00	0.00
WNW	0.00	3.47	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 56
East Liverpool, Ohio
5 December 2000 20:00 - 6 December 2000 8:00
Sampling Location WTI-2



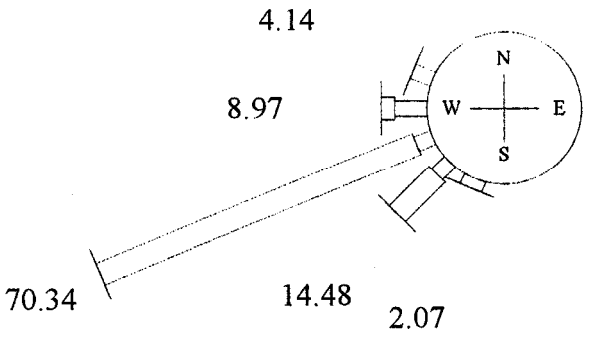


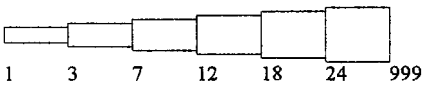
SCALE (MPH)

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH)	PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.69	2.08	0.00	0.00	0.00	0.00
W	38.19	31.25	0.00	0.00	0.00	0.00
WNW	26.39	0.69	0.00	0.00	0.00	0.00
NW	0.69	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 57
East Liverpool, Ohio
6 December 2000 8:00 - 6 December 2000 20:00
Sampling Location, WTI-2



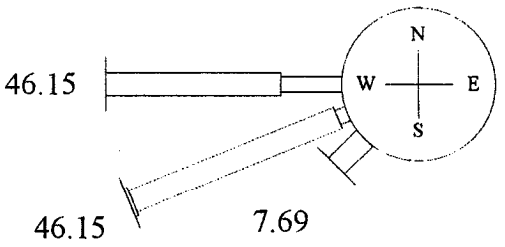


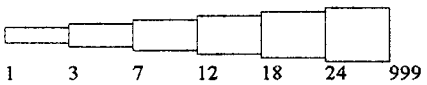
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WINK) SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	2.07	0.00	0.00	0.00	0.00
SW	3.45	11.03	0.00	0.00	0.00	0.00
WSW	3.45	66.90	0.00	0.00	0.00	0.00
W	6.21	2.76	0.00	0.00	0.00	0.00
WNW	4.14	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 58
East Liverpool, Ohio
6 December 2000 20:00 - 7 December2000 8:00
Sampling Location WTI-2



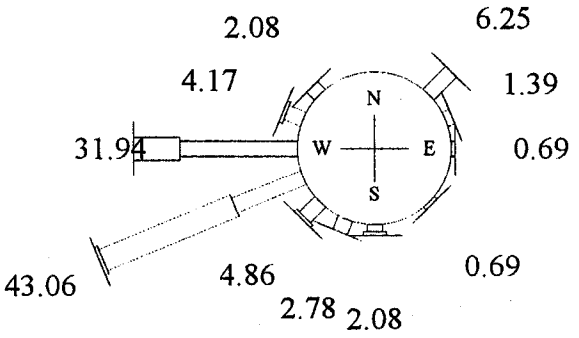


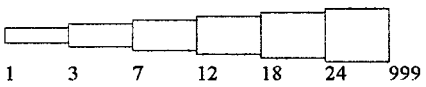
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	7.69	0.00	0.00	0.00	0.00
WSW	2.10	43.36	0.70	0.00	0.00	0.00
W	11.89	34.27	0.00	0.00	0.00	0.00
WNW	0.00	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 59
East Liverpool, Ohio
7 December 2000 8:00 - 7 December 2000 20:00
Sampling Location WTI-2



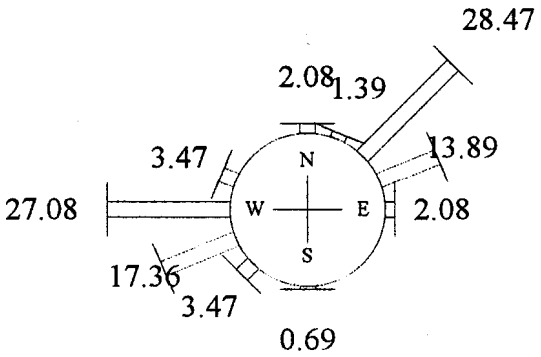


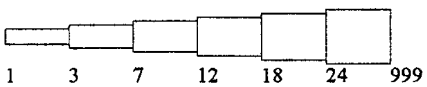
SCALE (MPH)

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	6.25	0.00	0.00	0.00	0.00	0.00
ENE	1.39	0.00	0.00	0.00	0.00	0.00
E	0.69	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.69	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	1.39	0.69	0.00	0.00	0.00	0.00
SSW	2.78	0.00	0.00	0.00	0.00	0.00
SW	4.17	0.69	0.00	0.00	0.00	0.00
WSW	14.58	27.78	0.69	0.00	0.00	0.00
W	22.92	9.03	0.00	0.00	0.00	0.00
WNW	3.47	0.69	0.00	0.00	0.00	0.00
NW	2.08	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 60
East Liverpool, Ohio
7 December 2000 20:00 - 8 December 2000 8:00
Sampling Location WTI-2





SCALE (MPH)

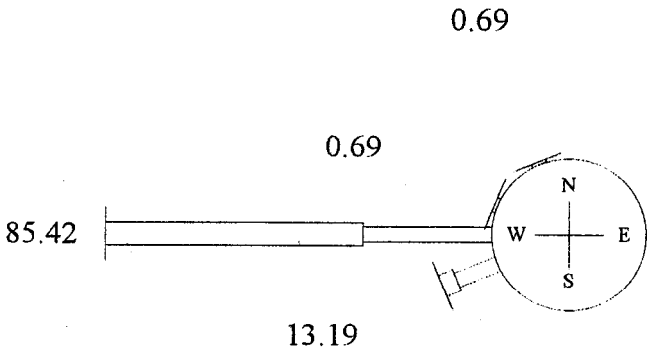
WIND SPEED (MPH) PERCENT OCCURRENCE

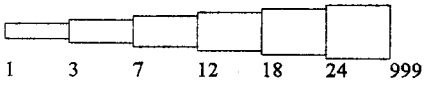
	1-3	3-7	7-12	12-18	18-24	>24
N	2.08	0.00	0.00	0.00	0.00	0.00
NNE	1.39	0.00	0.00	0.00	0.00	0.00
NE	28.47	0.00	0.00	0.00	0.00	0.00
ENE	13.89	0.00	0.00	0.00	0.00	0.00
E	2.08	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE

	1-3	3-7	7-12	12-18	18-24	>24
S	0.69	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	3.47	0.00	0.00	0.00	0.00	0.00
WSW	17.36	0.00	0.00	0.00	0.00	0.00
W	27.08	0.00	0.00	0.00	0.00	0.00
WNW	3.47	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 61
East Liverpool, Ohio
8 December 2000 8:00 - 8 December 2000 20:00
Sampling Location WTI-2





SCALE (MPH)

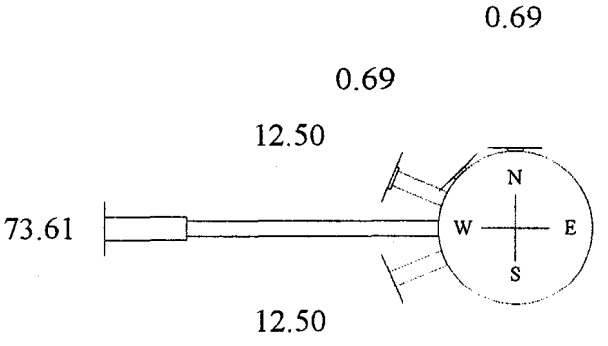
WIND SPEED (MPH) PERCENT OCCURRENCE

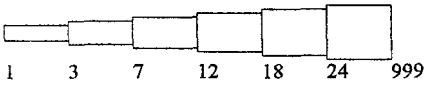
	1-3	3-7	7-12	12-18	18-24	>24
N	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE

	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	9.72	3.47	0.00	0.00	0.00	0.00
W	28.47	56.94	0.00	0.00	0.00	0.00
WNW	0.69	0.00	0.00	0.00	0.00	0.00
NW	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.69	0.00	0.00	0.00	0.00	0.00

Figure 62
East Liverpool, Ohio
8 December 2000 20:00 - 9 December 2000 8:00
Sampling Location WTI-2



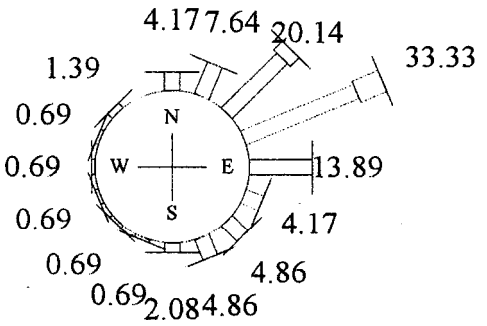


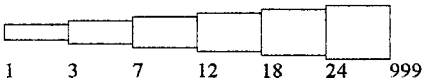
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	0.69	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	12.50	0.00	0.00	0.00	0.00	0.00
W	55.56	18.06	0.00	0.00	0.00	0.00
WNW	11.81	0.69	0.00	0.00	0.00	0.00
NW	0.69	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 63
East Liverpool, Ohio
9 December 2000 8:00 - 9 December 2000 20:00
Sampling Location WTI-2



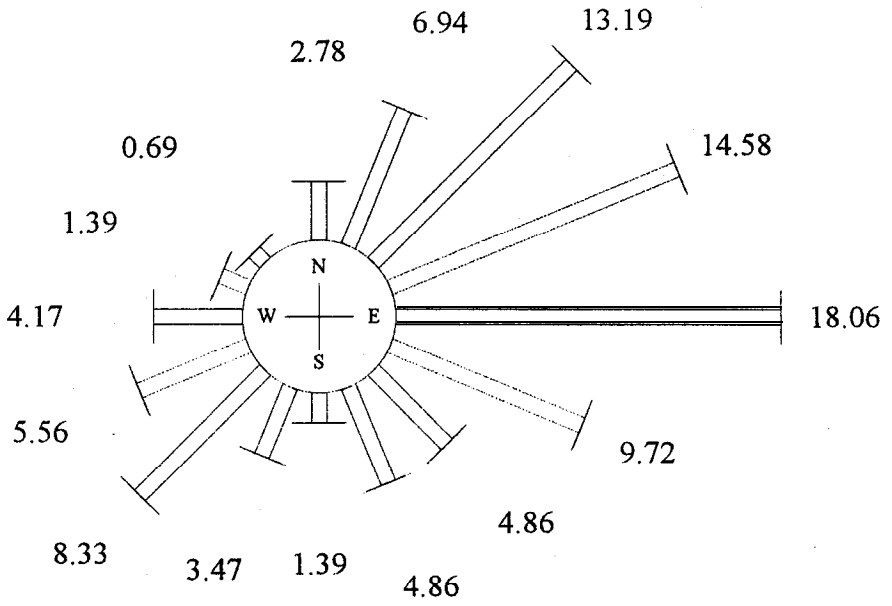


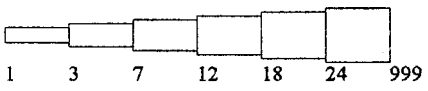
SCALE (MPH)

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
N	4.17	0.00	0.00	0.00	0.00	0.00
NNE	7.64	0.00	0.00	0.00	0.00	0.00
NE	17.36	2.78	0.00	0.00	0.00	0.00
ENE	27.08	6.25	0.00	0.00	0.00	0.00
E	13.89	0.00	0.00	0.00	0.00	0.00
ESE	4.17	0.00	0.00	0.00	0.00	0.00
SE	4.86	0.00	0.00	0.00	0.00	0.00
SSE	4.86	0.00	0.00	0.00	0.00	0.00

WIND SPEED (MPH) PERCENT OCCURRENCE						
	1-3	3-7	7-12	12-18	18-24	>24
S	2.08	0.00	0.00	0.00	0.00	0.00
SSW	0.69	0.00	0.00	0.00	0.00	0.00
SW	0.69	0.00	0.00	0.00	0.00	0.00
WSW	0.69	0.00	0.00	0.00	0.00	0.00
W	0.69	0.00	0.00	0.00	0.00	0.00
WNW	0.69	0.00	0.00	0.00	0.00	0.00
NW	1.39	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Figure 64
East Liverpool, Ohio
9 December 2000 20:00 - 10 December 2000 8:00
Sampling Location WTI-2





SCALE (MPH)

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
N	2.78	0.00	0.00	0.00	0.00	0.00
NNE	6.94	0.00	0.00	0.00	0.00	0.00
NE	13.19	0.00	0.00	0.00	0.00	0.00
ENE	14.58	0.00	0.00	0.00	0.00	0.00
E	18.06	0.00	0.00	0.00	0.00	0.00
ESE	9.72	0.00	0.00	0.00	0.00	0.00
SE	4.86	0.00	0.00	0.00	0.00	0.00
SSE	4.86	0.00	0.00	0.00	0.00	0.00

	WIND SPEED (MPH) PERCENT OCCURRENCE					
	1-3	3-7	7-12	12-18	18-24	>24
S	1.39	0.00	0.00	0.00	0.00	0.00
SSW	3.47	0.00	0.00	0.00	0.00	0.00
SW	8.33	0.00	0.00	0.00	0.00	0.00
WSW	5.56	0.00	0.00	0.00	0.00	0.00
W	4.17	0.00	0.00	0.00	0.00	0.00
WNW	1.39	0.00	0.00	0.00	0.00	0.00
NW	0.69	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00

Appendix A

ATSDR Correspondence
1 November, 2000 through 22 March, 2001

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Healthy People in a Healthy Environment

Addressee:
Joseph Laforma

Addressee Telephone Number:
732 321 6740

Facsimile Telephone Number:
732 321 6724

Sender:
Theresa McDermott

Sender Telephone Number:
404 639 4143

Number of Pages: 4
(including this page)

Date: 11/1/2000

Subject/Comments:
Area of Strike Team Comments and recommendations on air data. Sent to ATSDR

ATSDR Facsimile Numbers:

Office of the Assistant Administrator
Executive Park, Building 37, Room 3726
639-0700; Fax # 639-0744

Office of the Associate Administrator for Science
Executive Park, Building 37, Room 3720
639-0708; Fax # 639-0586

ATSDR Washington Office
Hubert H. Humphery Building, Washington, DC
(202) 690-7536; Fax # (202) 690-6985

Office of Federal Programs
Executive Park, Building 37, Room 3756
639-0730; Fax # 639-0759

Office of Policy and External Affairs
Executive Park, Building 35, Room 3552
639-0500; Fax # 639-0522

Office of Program Operations & Management
Executive Park, Building 35, Room 3526
639-0550; Fax # 639-0560

Office of Regional Operations
Executive Park, Building 37, Room 3701
639-6090, Fax # 639-0740

Regional Fax Numbers
Region 1:(617) 918-1494 Region 6: (214) 665-2237
Region 2: (212) 637-3253 Region 7: (913) 551-7061
Region 3: (215) 814-3003 Region 8: (303) 312-7018
Region 4: (404) 562-1790 Region 9: (415) 744-1797
Region 5: (312) 886-6066 Region 10: (206) 553-2142

ATSDR/EPA Liaison Office
Crystal Gateway: (703) 603-9100
Waterside Mall: (202) 260-6606

Division of Health Assessment & Consultation
Executive Park, Building 31, Room 3134
639-0610, Fax # 639-0654

Division of Health Education and Promotion
Executive Park, Building 4, Room 1104
639-6204, Fax # 639-6207/6208

Division of Health Studies

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries CERCLIS#: CRS#

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#**

ROUTING:

M. West, **FILE**

-AUTHOR INFORMATION-

User ID: Tak9 **Date:** November 1, 2000

Name: Theresa McDarmont **Time:** **AM____PM__1:46pm__**
Preparer: DHAC

-SITE/EVENT INFORMATION-

Site Name: Waste Technologies Industries (WTI)
CERCLIS #: **Cost Recovery #:**
Address: **City:** East Liverpool

County: **State:** OH **Zip Code:**
Region: 01 **Congressional District:**

-SITE STATUS-

(1) __ NPL X Non-NFL __RCRA __ Non-Site specific __Federal
(2) __ Emergency Response __Remedial __ Removal X Other:

-ACTIVITIES-

__ Incoming Call __ Public Meeting __ Health Consult __ Site Visit __ Outgoing Call
__ Other Meeting __ Health Referral __ Info Provided __ Conference Call __ Data Review
__ Written Response __ Training __ Incoming Mail __ Worker Health 01 Tech Assist
__ Emerg Response __ T-Crit Removal __ Non T-Critical Removal
Other Text:
Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Joseph Lafornara
Affiliation: US EPA/ERT
Phone #l: (732) 321-6740 **Fax: (732) -** 721-6724
Address: Lockheed Martin Technology Services Group Environmental Services REAC
2890 Woodbridge Avenue, Building 209 Annex
City: Edison **State:** NJ **Zip Code:** 08837-3679

County: **Congressional District:**

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#**

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi _____ (31) Sharon Wilbur _____

(31) Hana Pohl _____ ( ) _____

1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-COUNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-

__ Health Assessment	__ Health Studies	__ Tox Info-profile	__ Worker Health
__ Petition Assessment	__ Health Survellnc	__ Tox Info-Nonprofile	__ Admin
__ Emergency Response	__ Disease Registry	__ Subst-Spec Research	01 Other (Tech Assist)
__ Health Consultation	__ Exposure Registry	__ Health Education	

NARRATIVE SUMMARY:

USEPA Emergency Response Team provided ATSDR data on ambient air samples collected for volatile organic compounds, metals, and inorganic acids. These samples were taken by EPA on October 26, 2000 in response to public health concern of emissions coming from a hazardous waste incinerator located in East Liverpool, Ohio. Air samples were taken on the roof of the nearby (1000 feet) East Liverpool Elementary school, school play ground, and three other locations near school and upwind locations away from Waste Technologies Industries (WTI). EPA requested that ATSDR review the data and provide conclusions/recommendations on public health implications. EPA asked for specific recommendations regarding levels of Benzene.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

Benzene

ATSDR found that the levels of benzene (1.2 - 2.1 (ppb)) in the air samples provided were below the health based screening value of 4.0 ppb. The air samples were comparable to levels found in urban air. Therefore, the benzene levels in the air samples reviewed would not be considered of public health concern.

Lead

Levels of lead in air at the sampling concentrations (0.10 - 0.30 ug/m^3)) would add less than one microgram/deciliter to blood lead levels. With national blood background levels of approximately 3 mg/dl, the addition of less than 1 mg/dl would result in a value much less than the public health concern level set by CDC of 10 ug/dl.

Chromium

Levels of chromium ranged from 0.26 to 1.3 (ug/m^3) were significantly above ATSDRs health based screening values when evaluated for cancer effects from hexavalent chromium (CREG = 0.00008).

ATSDR has an EMEG of 0.5 ug/m³ for intermediate exposures to hexavalent chromium. Several values exceeded this level.

Recommendations

ATSDR recommends immediate additional air sampling of Chromium. Sampling should include speciation between Chromium VI and Chromium III and use of a lower detection level of 8 nanograms/cubic meter.

Signature:  **Date:** 11-1-00

Concurrence:_____ **Date:**_____

References

Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

Strike AROA WTI.wpd

Agency for Toxic Substances and Disease Registry
Facsimile Transmission

EXPOSURE INVESTIGATIONS AND CONSULTATION BRANCH

TO: Raja Singhvi

FAX NO. (732) 321-6724

PHONE NO. (732) 321 6740

DATE: November 8, 2000

NUMBER OF PAGES: 3
(Not including this page)

FROM: Therese McDermott / 404 639-4745
Strike team leader

Agency for Toxic Substance and Disease Registry
Division of Health Assessment and Consultation
Mail Stop E32
1600 Clifton Road
Atlanta, Ga. 30333

FAX NO. (404) 639-0655
TEL NO. (404) 639-0616

COMMENTS:

Raja,
AROA for Morganese in air. From the ATSDR Strike Team
If you have any questions, please give me a call
Therese

Please Distribute to your folks at EPA as appropriate.

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#A-180**

ROUTING:

M. West, **FILE**

-AUTHOR INFORMATION-

User ID: Tak9 **Date:** November 6, 200O

Name: Theresa McDarmont **Time: AM___PM_5:00pm__**
Preparer: DHAC

-SITE/EVENT INFORMATION-

Site Name: Waste Technologies Industries (WTI)
CERCLIS#: **Cost Recovery #:** A- 180
Address: **City: East Liverpool**

County: **State:** OH **Zip Code:**
Region: 01 **Congressional District:**

-SITE STATUS-

(1) __ NPL X Non-NPL __RCRA __ Non-Site specific __ Federal
(2) __ Emergency Response __Remedial __ Removal X Other:

-ACTIVITIES-

__ Incoming Call __ Public Meeting X Health Consult __ Site Visit __ Outgoing Call
__ Other Meeting __ Health Referral __ Info Provided __ Confer-once Call __ Data Review
__ Written Response __ Training. __ Incoming Mail __ Worker Health 01 Tech Assist
__ Emerg Response __ T-Crit Removal __ Non T-Critical Removal
Other Text:
Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Raja Singhvi
Affiliation: US EPA/ERT
Phone #l: (732) 321-6740 **Fax:** (732) - 721-6724
Address: Lockheed Martin Technology Services Group Environmental Services REAC
2890 Woodbridge Avenue, Building 209 Annex
City: Edison **State:** NJ **Zip Code:** 08837-3679

County: **Congressional District:**

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#A-180**

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi
(31) John Wheeler
(1) Peter Grevatt
(31) Frank Schnell
(1) Caroline Previ

1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-COUNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-

__ Health Assessment	__ Health Studies	__ Tox Info-profile	__ Worker Health
__ Petition Assessment	__ Health Survcllnc	__ Tox Info-Nonprofile	__ Admin
__ Emergency Response	__ Disease Registry	__ Subst-Spec Research	__ Other (Tech Assist)
X Health Consultation	__ Exposure Registry	__ Health Education	

NARRATIVE SUMMARY:

USEPA Emergency Response Team provided ATSDR data on ambient air samples collected for metals. These samples were taken by EPA November 1st and 2nd, 2000, in response to the public health concern of emissions coming from a hazardous waste incinerator located in East Liverpool, Ohio. Air samples were taken on the roof of the nearby (1000 feet) East Liverpool Elementary school, school play ground, and three other locations near the school and upwind locations away from Waste Technologies Industries (WTI). EPA requested that ATSDR review the data and provide conclusions/recommendations on public health implications. EPA asked for specific recommendations regarding levels of manganese.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

During the November 1st- 2nd sampling event a total of 17 air samples were taken and analyzed for metals (NIOSH Method 7300). Data for 5 metals, calcium, iron, lead, manganese and zinc were provided to ATSDR for this review. Levels of manganese near the WTI Incinerator ranged from 0.37 - 2.4 (ug/m^3) with an average level of 1.0 (ug/m^3). Three samples were taken upwind at a location 1.5 miles from WTI to serve as the background, these samples ranged from 0.41 - 7.3 (ug/m^3). All of the background values and most of the levels near WTI were above ATSDRs EMEG, of 0.4 ug/m^3 for intermediate exposures to manganese. Based on occupational studies, levels of manganese of 140 (ug/m^3) (LOAEL) may cause mild neurological effects.

Recommendations

It is unclear why background levels of manganese were relatively higher than site levels. This is particularly true for the one sample showing 7.3 ug/m^3. Because detected levels of manganese were above ATSDR health based. screening values, futher characterization is needed to address public health implications. ATSDR recommends immediate additional air sampling of manganese.

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#A-180**

Signature: [signature] **Date:** 11-8-2000

Concurrence: [signature] **Date:** 11-8-2000

References

Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

Strike AROA WTIMn.wpd

Agency for Toxic Substances and Disease Registry
Facsimile Transmission

EXPOSURE INVESTIGATIONS AND CONSULTATION BRANCH

TO: Raj Singhvi

FAX NO. (832) 321-6724

PHONE NO. ( )

DATE: 11-22-00

NUMBER OF PAGES: 3
(Not including this page)

FROM: Theresa McDermott

Agency for Toxic Substance and Disease Registry
Division of Health Assessment and Consultation
Mail Stop E32
1600 Clifton Road
Atlanta, Ga. 30333

FAX NO. (404) 639-0655
TEL NO. (404) 639-0616

COMMENTS:
Strike team response AROA to recent air sampling event.

Theresa

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS#A-180**

ROUTING:

M. West, **FILE**

-AUTHOR INFORMATION-

User ID: Tak9 **Date:** November 21, 200O

Name: Theresa McDarmont **Time: AM___PM_3:00pm__**
Preparer: DHAC

-SITE/EVENT INFORMATION-

Site Name: Waste Technologies Industries (WTI)
CERCLIS #: **Cost Recovery** #: A-180
Address: **City:** East Liverpool

County: **State:** OH **Zip Code:**
Region: 01 **Congressional District:**

-SITE STATUS-

(1) __ NPL X Non-NPL __ RCRA __ Non-Site specific __ Federal
(2) __ Emergency Response __ Remedial __ Removal X Other:

-ACTIVITIES-

__ Incoming Call __ Public Meeting X Health Consult __ Site Visit __ Outgoing Call
__ Other Meeting __ Health Referral __ Info Provided __ Conference Call __ Data Review
__ Written Response __ Training __ Incoming Mail __ Worker Health 01 Tech Assist
__ Emerg Response __ T-Crit Removal __ Non T-Critical Removal
Other Text:
Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Raj Singhvi
Affiliation: US EPA/ERT
Phone #l: (732) 321-6740 **Fax:** (732) - 321-6724
Address: 2890 Woodbridge Avenue, Building 18
City: Edison **State:** NJ **Zip Code:** 08837-3679

County: **Congressional District:**

ATSDR RECORD OF ACTIVITY

Site Name: WTl Waste Technologies Industries **CERCLIS#:** **CRS#A-I80**

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi
(31) John Wheeler
(31) Robert Williams

1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-COUNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-

__ Health Assessment	__ Health studies	__ Tox Info-profile	__ Worker Health
__ Petition Assessment	__ Health Survellnc	__ Tox Info-Nonproflle	__ Admin
__ Emergency Response	__ Disease Registry	__ Subst-Spec Research	__ Other (Tech Assist)
X Health Consultation	__ Exposure Registry	__ Health Education	

NARRATIVE SUMMARY:

USEPA Emergency Response Team provided ATSDR data on ambient air samples collected for metals. These samples were taken by EPA on November 7th, 8th, 11th, 12th, 2000, in response to the public health concern of emissions coming from a hazardous waste incinerator located in East Liverpool, Ohio. Air samples were taken on the roof of the nearby (1000 feet) East Liverpool Elementary school, school play ground, and three other locations near the school and upwind locations away from Waste Technologies Industries (WTI). EPA requested that ATSDR review the data and provide conclusions/recommendations on public health implications.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

During the November 7 - 12 sampling event, a total of 24 air samples were taken and analyzed for metals (NIOSH Method 7300). Data for 13 metals, aluminum, antimony, arsenic barium, calcium chromium, copper, iron, lead, manganese, nickle, selenium, and zinc were provided to ATSDR for this review. None of the levels of the metals sampled were at levels of public health concern. Levels of manganese near the WTI Incinerator ranged from ND - 4.1 (ug/m^3). Four samples were taken upwind at a location 1.5 miles from WTI to serve as the background, these samples ranged from 0.012 - 22 (ug/m^3), The majority of the background values and most of the levels near WTI were above ATSDRs EMEG, of 0.4 ug/m^3 for intermediate exposures to manganese. Based on occupational studies, levels of manganese of 140 ug/m^3 (LOAEL) may cause mild neurological effects.

Recommendations

It is unclear why background levels of manganese were relatively higher than site levels. This is particularly true for the one sample showing 22 ug/m^3. The results of manganese levels in the previous sampling event on November 1 - 2, were within the range of the current air sampling results. Although

adverse health effects from the current levels are not expected, increased levels could raise health concerns; therefore, periodic monitoring is recommended.

When chromium speciation data become available, ATSDR will be available to review.

Signature: [signature] **Date:** 11-22-00

Concurrence: _____ **Date:** _____

References

Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

Strike AROA WTIAir3.wpd

Agency for Toxic Substances and Disease Registry
Facsimile Transmission

EXPOSURE INVESTIGATIONS AND CONSULTATION BRANCH

TO: Raj Singhvi	FROM: Maurice West
FAX NO. (732) 321-6724	Agency for Toxic Substance and Disease Registry Division of Health Assessment and Consultation Mail Stop E32 1600 Clifton Road Atlanta, Ga. 30333
PHONE NO. (732) 321-6740	
DATE: 12/7/00	FAX NO. (404) 639-0655 TEL NO. (404) 639-0616
NUMBER OF PAGES: 3 (Not including this page)	

COMMENTS:

Per your email regest - Attch on air & soil samples taken @ Liverpool Elementary School & Walter Ave. Pls call w/ any questions or Comments.

M. P. West

ATSDR RECORD OF ACTIVITY

Site Name: East Liverpool (WTI) **CERCLIS#** OHD980613541 **CRS#** A180

ROUTING:	
	M. West
	FILE

-AUTHOR INFORMATION-

User ID: JZW1 **Date:** November 28, 2000
Name: John Wheeler **Time:** 15:30
Preparer: DHAC/EICB

-SITE/EVENT INFORMATION-

Site Name: East Liverpool (AKA Waste Technologies Industries. WTI)
CERCLIS #: OHD980613541 **Cost Recovery #:** A180
Address: **City:** E. Liverpool
County: **State:** OH **Zip Code:**
Region: 05 **Congressional District:**

-SITE STATUS-

NPL Non-NPL RCRA Non-Site specific Federal

__ Emergency Response __ Remedial __ Removal __ Other: Strike Team

-ACTIVITIES-

__ Incoming Call __ Public Meeting __ Health Consult __ Site Visit __ Outgoing Call
__ Other Meeting __ Health Referral __ Info Provided __ Conference Call __ Data Review
__ Written Response __ Training __ Incoming Mail __ Worker Health __ Tech Assist
__ Emerg Response __ T-Crit Removal __ Non T-Critical Removal

OtherText:

Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Raj Singhvi
Affiliation: US EPA/ERT
Phone #l: (732) 321-6740 **Phone #2:** Fax (732) - 321-6724
Address: 2890 Woodbridge Avenue, Building 18
City: Edison State: NJ **Zip Code:** 08837-3679

ATSDR RECORD OF ACTIVITY

Site Name: East Liverpool (WTI) **CERCLIS#** OHD980613541 **CRS#** A180

County: _____ **Congressional District:** _____

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi ( ) _____

(31) Sharon Wilbur / DT ( ) _____

1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-COUNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-							
	Health Assessment		Health Studies		Tox Info-profile		Worker Health
	Petition Assessment		Health Surveilnc		Tox Info-Nonprofile		Admin
	Emergency Response		Disease Registry		Subst-Spec Research		Other:
	Health Consultation		Exposure Registry		Health Education		

NARRATIVE SUMMARY:

USEPA Emergency Response Team provided ATSDR data on soil and air samples collected for metals. The air samples were taken by EPA on November 14, 15, 16, and 17 at five different locations, East Liverpool Elementary School, water treatment facility, Lawrenceville, City Hall, and Walter Ave. The sampling at City Hall had to be discontinued and therefore results were not reported. The report is &ted 11/22/2000. Soil samples were collected from 6 different areas. Four samples were collected at the Liverpool Elementary School and two samples were collected on Walter Avenue. EPA requested ATSDR to evaluate the metal data for health concerns.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

Conclusion:

None of the reported levels in either air or soil poses a public health concern from any route of exposure for any exposure duration. It is noted however that ATSDR considers chromium found at the site to be chromium III and not chromium VI. Studies are presently being conducted by EPA in Research Triangle Park to better characterize the chromium species found at the site. ATSDR understands that it will he consulted when the analysis becomes available.

In addition, the ATSDR Strike Team found it important that the peak levels of 11 of 16 metals found in air occurred on the same day (November 16) at the same location (water treatment facility). While these levels do not pose a health threat it suggests that better characterization of peak levels be obtained. It is unclear if this is a one time excursion or if the levels measured represent peak values.

ATSDR RECORD OF ACTIVITY

Site Name: East Liverpool (WTI) **CERCLIS#** OHD980613541 **CRS#** A180

Recommendation:

1) Determine the source of air contaminants. The addition of meteorological data to the air data and sample locations would be useful.

2) If further sampling reveals continued "spikes" of air contamination determine the frequency and magnitude of those spikes.

3) Continue working with EPA at RTP on chromium speciation issues and share findings with ATSDR when available.

Signature: _____ **Date:** 12/7/00

Concurrence: M.C. West **Date:** 12/7/00

cc:
Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

WTI air soil.wpd

Agency for Toxic Substances and Disease Registry
Facsimile Transmission

EXPOSURE INVESTIGATIONS AND CONSULTATION BRANCH

TO: Raj Singhvi

FAX NO. (732) 321-6729

PHONE NO. ( )

DATE: November 15 2000

NUMBER OF PAGES: 3
(Not including this page)

FROM: Theresa McDermott

Agency for Toxic Substance and Disease Registry
Division of Health Assessment and Consultation
Mail Stop E32
1600 Clifton Road
Atlanta, Ga. 30333

FAX NO. (404) 639-0655
TEL NO. (404) 639-0616

COMMENTS:

Strike team AROA for soil data from WTI Site.
Please let me know if you have any questions.

Thanks
Theresa

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS# A-180**

ROUTING:

M. West, **FILE**

-AUTHOR INFORMATION-

User ID: Tak9 **Date:** November 9, 2000

Name: Theresa McDarmont **Time: AM___PM_1:46pm__**
Preparer: DHAC

-SITE/EVENT INFORMATION-

Site Name: Waste Technologies Industries (WTI)
CERCLIS #: **Cost Recovery #:**
Address: **City:** East Liverpool

County: **State:** OH **Zip Code:**
Region: 01 **Congressional District:**

-SITE STATUS-

(1) __ NPL X Non-NPL __ RCRA __ Non-Site specific __ Federal
(2) __ Emergency Response __ Remedial __ Removal X Other:

-ACTIVITIES_

__ Incoming Call __ Public Meeting X Health Consult __ Site Visit __ Outgoing call
__ Other Meeting __ Health Referral __ Info Provided __ Conference Call __ Data Review
__ Written Response __ Training __ Incoming Mail __ Worker Health 01 Tech Assist
__ Emerg Response __ T-Crit Removal __ Non T-Critical Removal
Other Text:
Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Raj Singhvi
Affiliation: US EPA/ERT
Phone #l: (732) 321-6740 **Fax:** (732) - 321-6724
Address: 2890 Woodbridge Avenue, Building 18
City: Edison **State:** NJ **Zip Code:** 08837-3679

County: **Congressional District:**

ATSDR RECORD OF ACTIVITY

Site Name: WTI Waste Technologies Industries **CERCLIS#:** **CRS# A-180**

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi (31) John Wheeler

(31) Hana Pohl (1) Caroline Previ

1-EPA	2-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-COUNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL.	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-

__ Health Assessment	__ Health Studies	__ Tox Ho-profile	__ Worker Health
__ Petition Assessment	__ Health Survellnc	__ Tox Info-Nonprofile	__ Admin
__ Emergency Response	__ Disease Registry	__ Subst-Spec Research	01 Other (Tech Assist)
X Health Consultation	__ Exposure Registry	__ Health Education	

NARRATIVE SUMMARY:

USEPA Emergency Response Team provided ATSDR data on soil samples collected for metals, and dioxin/furrans. These samples were taken by EPA on October 26, 2000 in response to public health concern of emissions coming from a hazardous waste incinerator located in East Liverpool, Ohio. Soil samples were taken at the nearby (1000 feet) East Liverpool Elementary school, school play ground, and three other locations near school and upwind locations away from Waste Technologies Industries (WTI). EPA requested that ATSDR review the data and provide conclusions/recommendations on public health implications. EPA asked for specific recommendations regarding levels of dioxin, zinc and arsenic.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

During the October 26, 2000, sampling event a total of 10 soil samples were taken and analyzed for metals and-dioxin. The level of arsenic in one of the samples (36.6mg/kg) did slightly exceed ATSDR's Chronic EMEG of 20 mg/kg for children, but was well below the adult chronic EMEG of 200 mg/kg. ATSDR found that all the metals in the sampling data including zinc and arsenic in the soil samples were not at levels of public health concern.

Dioxins and furans were adjusted for 2378 TCDD equivalents and an overall TEQ value was provided, as well as, individual levels of dioxins. Levels of dioxin in soil were well below screening levels for children and adults, as were TEQ values. The levels of dioxin are not considered a public health concern.

Recommendations

None

Signature: [signature] Date: 11-13-00

Concurrence:_____ Date:_____

References

cc:
Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

Strike AROA WTIsoil.wpd

ATSDR RECORD OF ACTIVITY

Site Name: East Liverpool (WTI) **CERCLIS#** OHD980613541 **CRS#** A180

ROUTING:
M. West
FILE

-AUTHOR INFORMATION-

User ID: dds9 **Date:** March 22, 2001
Name: David S. Sutton, Ph.D. **Time:** 9:00 AM
Preparer: DHAC/EICB/CS

-SITE/EVENT INFORMATION-

Site Name: East Liverpool (AKA Waste Technologies Industries, WTI)
CERCLIS #: OHD980613541 **Cost Recovery #:** A180
Address: 1250 St. George **City:** East Liverpool
County: Columbiana **State:** OH **Zip Code:** 43920
Region: 05 **Congressional District:** 17

-SITE STATUS-

___ NPL ___ Non-NPL ___ RCRA ___ Non-Site specific ___ Federal
___ Emergency Response ___ Remedial ___ Removal ✓ Other: Strike Team

-ACTIVITIES-

01 Incoming Call ___ Public Meeting ___ Health Consult ___ Site Visit ___ Outgoing Call
___ Other Meeting ___ Health Referral ___ Info Provided ___ Conference Call ___ Data Review
___ Written Response ___ Training ___ Incoming Mail ___ Worker Health ✓ Tech Assist
___ Emerg Response ___ T-Crit Removal ___ Non T-Critical Removal

Other Text:

Consult Category:

-REQUESTOR AFFILIATION-

Requestor: Raj Singhvi
Affiliation: US EPA/ERT
Phone #l: (732)321-6740 **Phone #2:** Fax (732)321-6724
Address: 2890 Woodbridge Avenue, Building 18
City: Edison State: NJ **Zip Code:** 08837-3679
County: **Congressional District:**

-CONTACTS AND AFFILIATION-

(1) Raj Singhvi ()
(31) Sharon Wilbur / DT ()

l-EPA	I-USCG	3-OTHER FED	4-STATE ENV	5-STATE HLT	6-C0UNTY HLT
7-CITY HLTH	8-HOSPITAL	9-LAW ENFORE	10-FIRE DEPT	11-POISON CTR	12-PRIV CITZ
13-OTHER	14-UNKNOWN	15-DOD16-DOE	17-NOAA	18-OTHR STATE	19-OTHR CNTY
20-OTHR CITY	21-INTL	22-CITZ GROUP	23-ELECT.OFF	24-PRIV. CO	25-NEWS MEDIA
26-ARMY	27-NAVY	28-AIR FORCE	29-DEF LOG AGCY	30-NRC	31-ATSDR

-PROGRAM AREAS-

	Health Assessment		Health Studies		Tox Info-profile		Worker Health
	Petition Assessment		Health Surveillnc		Tox Info-Nonprofile		Admin
	Emergency Response		Disease Registry		Subst-Spec Research		Other:
	Health Consultation		Exposure Registry		Health Education		

NARRATIVE SUMMARY:

USEPA Emergency Response Team (ERT) has conducted air and soil sampling in East Liverpool, Ohio in response to citizens concerns about emissions from the Waste Technologies Industries (WTI) hazardous waste incinerator. ERT has conducted 5 rounds of sampling beginning in October 2000. ERT has requested the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate these sampling results for public health implications. In separate ATSDR Record of Activities (AROAS), ATSDR has provided its health conclusions to sampling rounds 1, 2, 3, and 4. This AROA evaluates samples collected during sampling round 5.

Sampling round 5 consisted of ambient air samples collected at twelve locations and analyzed for metals, volatile organic compounds (VOCs), or particulates (PM_{lo}). At one location, a duplicate sample was collected: WTI 5D. The samples were collected by ERT on December 5 through December 10, 2000. The twelve sampling locations are listed in Table 1.

TABLE 1
Sampling Locations in East Liverpool Community (Round 5)

WTI 1	School Administration Building Roof
WTI 2	Water Treatment Plant
WTI 2a	Water Treatment Plant -- PM_{10}
WTI 4	City Hall Roof
WTI 5	End of Walter Street
WTI 5D	End of Walter Street -- Duplicate
WTI 6	Port Authority Parking Area
WTI 7	West End of Ohio Avenue
WTI 8	Route 39E at Monument
WTI 9	Route 39E at Entrance
WTI 10	East End of S.H. Bell
WTI 11	Cause Ave. at East End of S.H. Bell

Eleven sampling events were completed. Each sampling-event consisted of samples collected from 4 to 12 sampling locations (i.e., the number of sample locations used per sampling event varied) with 107 total samples collected and analyzed. Samples collected for metals were analyzed for 22 metals using the modified NIOSH Method 7300 (Elements, ICP). The metals consisted of aluminum, antimony, arsenic barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. The collected samples were also analyzed for 46 VOCs using NIOSH Methods 1003, 1500, and 1501.

ACTION REQUIRED/RECOMMENDATIONS/INFO PROVIDED:

VOCs were sampled for at WTI-1, WTI-2, WTI-5, and WTI-6. Compounds detected included benzene, carbon tetrachloride, toluene, xylene. Because of the low VOC levels detected, the measured concentrations were estimated and below ATSDR comparison values (i.e., of no public health concern), except for benzene. The estimated detections for benzene ranged from 0.64 - 2.2 µg/m^3. The ATSDR comparison value for benzene is 0.1 µg/m^3 for cancer (note, the method detection limit (MDL) for benzene during sampling round 5 was 2.9 µg/m^3). Likewise, based on available medical, epidemiologic, and toxicologic studies, ATSDR do not expect that the benzene levels estimated in the community near the WTI facility to cause any adverse health effects [l].

Table 2 summarizes the measured air concentrations for metals during sampling round 5. Most of the metals detected during sampling round 5 are within levels typically found in air for urban areas across the United States; however, it is still unclear what are the true probable sources for these detected metals. None of the. detected levels for metals were at levels of public health concern, except for manganese. The detected manganese levels during sampling round 5 were above ATSDR's EMEG, of 0.04 µg/m^3 for chronic exposures to manganese in air. Levels of manganese detected in the East Liverpool Community ranged from ND - 8.9 µg/m^3 at all locations. The highest manganese level was detected at Location WTI 5. (i.e., 8.9 µg/m^3). Location WTI

TABLE 2: SUMMARY OF DETECTED AIR CONCENTRATIONS (METALS) AT WTI SITE

Aluminum	0.17 -- 48	0.24 -- 4.3	17
Antimony	0.0067 -- 1.9	Not Detected	0
Arsenic	0.0067 -- 1.9	0.03	1
Barium	0.017 -- 4.8	0.017 -- 0.028	4
Beryllium	0.0067 -- 1.9	Not Detected	0
Cadmium	0.017 -- 4.8	Not Detected	0
Calcium	0.34 -- 96	0.38 -- 9.2	29
Chromium	0.017 -- 4.8	0.02 -- 0.29	12
Cobalt	0.033 -- 9.6	Not Detected	0
Copper	0.033 -- 9.6	0.037 -- 0.54	3
Iron	0.084 -- 24	0.17 -- 46	39
Lead	0.0067 -- 1.9	0.0075 -- 0.34	36
Magnesium	1.7 -- 480	Not Detected	0
Manganese	0.017 -- 4.8	0.02 -- 8.9	64
Nickel	0.033 -- 9.6	0.071	1
Potassium	6.7 -- 1,900	Not Detected	0
Selenium	0.0067 -- 1.9	0.0069 -- 0.013	14
Silver	0.017 -- 4.8	0.23	1
Sodium	1.7 -- 480	2.1 -- 7.6	3
Thallium	0.0067 -- 1.9	Not Detected	0
Vanadium	0.033 -- 9.6	0.037	1
Zinc	0.033 -- 9.6	0.037 -- 0.86	43

[1] An environmental release tidbit, the predominant source or origin of most benzene in urban air is from cars and trucks; likewise, the benzene levels estimated in the community near the WTI facility during sampling round 5 are very comparable to levels found in air for most typical urban areas across the United States [1].

5 is along the Ohio River directly east of one of the operations for the S.H. Bell Company, which could be a probable source. As stated in the previous AROAs discussing sampling rounds 1, 2, 3, and 4 results, ATSDR does not expect these detected manganese levels to cause any adverse health effects since the detected levels are far lower than the reported manganese levels of 140 $\mu g/m^3$ (LOAEL) that may cause mild neurological effects, as documented in occupational studies [2].

Also as mentioned in the AROA discussing sampling round 4 results, ATSDR considers chromium detected in the community near the WTI facility to be chromium III and not chromium VI. Studies are presently being conducted by USEPA in Research Triangle Park (RTP) to better characterize the chromium species detected in the East Liverpool Community. ATSDR understands that it will be consulted when the analyses become available.

Recommendations

1) Continue to determine the source of air contaminants.

2) Continue working with USEPA at RTP on chromium speciation issues and share findings with ATSDR when available.

3) Continue to monitor levels of metals and VOCs periodically since any increased levels could raise health concern.

Signature: *David S. Sutton, Ph.D.* **Date:** March 22, 2001

David S. Sutton, Ph.D.
Environmental Engineer

Concurrence: *Brian Kahlan* **Date:** March 22, 2001

Brian Kaplan
Environmental Health Scientist

References

1. Agency for Toxic Substances and Disease Registry. 1997. Toxicological Profile for Benzene, US DHHS. Public Health Service. Atlanta, GA.

2. Agency for Toxic Substances and Disease Registry. 2000. Toxicological Profile for Manganese, US DHHS. Public Health Service. Atlanta, GA.

cc:
Maurice West, Deputy Branch Chief, EICB
ATSDR Regional Representative

AROA-5thRD-Final-WTI.wpd